Installing Cisco CSR 1000v Licenses

Activating Cisco CSR 1000v Licenses

When the Cisco CSR 1000v or Cisco ISRv first boots, it boots in evaluation mode. The network interfaces are activated but throughput is limited to 2.5 Mbps and the feature support is limited. Activate the software licenses to obtain the throughput and feature support provided by the license. For information about the available licenses in your software version, see the Cisco CSR 1000v Release Notes. The Cisco CSR 1000v and Cisco ISRv support the following options to activate the software licenses:

Cisco Software Licensing (CSL)	Installing the Cisco CSR 1000v/Cisco ISRv licenses using Cisco Software Licensing (CSL) uses a similar process to that of other Cisco router platforms. See Installing CSL Evaluation Licenses for Cisco IOS XE 3.13S and Later, on page 2 and subsequent sections.
Cisco Smart Licensing	Cisco CSR 1000v and Cisco ISRv support activation using Cisco Smart Licensing. (Cisco IOS XE Release 3.15S and later.) See Cisco Smart Licensing, on page 19.

Cisco Software Licensing (CSL)

Installing CSL Evaluation Licenses for Cisco IOS XE 3.13S and Later

In Cisco IOS XE 3.13S and later, including IOS XE Denali 16.2 and later, the Cisco CSR 1000v/ISRv first boots with the AX feature set enabled and the maximum throughput limited to 100 Kbps. The following evaluation licenses are available:

- AX feature set with 50 Mbps maximum throughput
- APPX feature set with 5 Gbps maximum throughput

The evaluation licenses are available for download at the Cisco Software Licensing portal.

Note If you are installing an evaluation license for a feature set with a maximum throughput of 10 Gbps, then additional configuration is required to support the 10 Gbps interface. For more information, see the *Configuring an Interface for 10Gbps Maximum Throughput* section in this guide.

Perform the following steps after the router first boots:

SUMMARY STEPS

1. **enable**
2. **show license udi**
3. Log on to the Cisco Software Licensing portal to obtain the evaluation license: http://www.cisco.com/go/license.
4. **license install** *stored-location-url*
5. **configure terminal**

6. **license boot level {ax | appx}**
7. **end**
8. **write memory**
9. **reload**
10. **show license detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**show license udi** **Example:** `show license udi`	Displays all the UDI values that can be licensed in a system. • You need the UDI of the device to obtain the evaluation license.
Step 3	Log on to the Cisco Software Licensing portal to obtain the evaluation license: http://www.cisco.com/go/license.	**a.** Click on **Continue to Product Registration**. **b.** Click on **Get Other Licenses** and select **Demo and Evaluation.** **c.** Under Product Family, select **Router & Switches**. **d.** Under **Product**, select **Cisco Cloud Services Router 1000v** **e.** Click **Next**. **f.** Select the evaluation license. **g.** Select whether the evaluation license will be used on an Amazon AWS instance, a standalone deployment, or other deployment. **h.** In the UDI Serial Number field, enter the 11-character UDI obtained in step 2. Note that the UDI is case-sensitive, and should be entered in all capital letters. **i.** Specify the Product ID; for example, CSR1000v. **j.** Download the evaluation license.
Step 4	**license install** *stored-location-url* **Example:** `license install bootflash:90NVHJ3C26E_20140724194119019.lic`	Installs the evaluation license obtained in the previous steps. • Accept the End-User License Agreement when prompted.

	Command or Action	Purpose
Step 5	**configure terminal** **Example:** `configure terminal`	Enters global configuration mode.
Step 6	**license boot level {ax | appx}** **Example:** `license boot level ax`	Activates the evaluation license on the router upon the next reload. Select **ax** if installing the AX feature set evaluation license. Select **appx** if installing the APPX feature set evaluation license. Accept the end user license agreement when it is prompted.
Step 7	**end** **Example:** `end`	Exits global configuration mode.
Step 8	**write memory** **Example:** `write memory`	Saves the running configuration to NVRAM.
Step 9	**reload** **Example:** `reload`	Restarts the router to enable the feature set and the maximum throughput supported by the evaluation license. The router reloads with the evaluation license activated. The evaluation license expires 60 days from the time it is activated.
Step 10	**show license detail** **Example:** `show license detail`	Displays the license information.

What to do next

Note If you are installing an evaluation license for a feature set with a maximum throughput of 10 Gbps, then additional configuration is required to support the 10 Gbps interface. For more information, see the *Configuring an Interface for 10Gbps Maximum Throughput* section in this guide.

Installing CSL Regular Licenses for Cisco IOS XE 3.13S and Later

In Cisco IOS XE 3.13S and later, including IOS XE Denali 16.3 and later, the Cisco CSR 1000v/ISRv first boots in limited mode with the AX feature set enabled and the maximum throughput limited to 100 Kbps.

You can generate multiple licenses for the router from one PAK. The purchased PAK determines the number of licenses you can generate.

Repeat these steps for each license available for your PAK.

Note If you installed a license that supports a maximum throughput of 10 Gbps, then additional configuration is required to support the 10 Gbps interface. For more information, see the *Configuring an Interface for 10Gbps Maximum Throughput* section in this guide.

SUMMARY STEPS

1. Obtain the PAK.
2. **enable**
3. **show license udi**
4. Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal.
5. **license install** *stored-location-url*
6. **configure terminal**
7. **license boot level {ipbase | security** | **ax | appx**}
8. **end**
9. **write memory**
10. **reload**
11. **show license detail**
12. **platform hardware throughput level MB**{**10 | 100 | 1000 | 10000 | 250 | 2500 | 50 | 500 | 5000**}

DETAILED STEPS

Step 1 Obtain the PAK.

The PAK is provided to you when you order or purchase the right to use a feature set.

- The PAK serves as a receipt and is used as part of the process to obtain a license.

Step 2 **enable**

Enables privileged EXEC mode.

- Enter your password if prompted.

Step 3 **show license udi**

Displays all the UDI values that can be licensed in a system.

- You need the UDI of the device as part of the process to obtain a license.

Step 4 Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal.

Example:

When entering the UDI, enter only the 11-character serial number; for example,

```
966975BITWG
```

. The UDI is case-sensitive, and should be entered in all capital letters.

After entering the appropriate information, you will receive an e-mail containing the license information that you can use to install the license:

- Copy the license file received from the Cisco Product License Registration portal to the appropriate file system on the device.

Step 5 **license install** *stored-location-url*

Example:

```
Router# license install bootflash:90NVHJ3C26E_20140724194119019.lic
```

Installs the license.

- Accept the end-user license agreement if prompted.

Step 6 **configure terminal**

Example:

```
Router# configure terminal
```

Enters global configuration mode.

Step 7 **license boot level {ipbase | security | ax | appx}**

Example:

```
Router(config)# license boot level ax
```

Activates the license on the router upon the next reload.

Step 8 **end**

Example:

```
Router(config)# end
```

Exits configuration mode.

Step 9 **write memory**

Example:

```
Router# write memory
```

Saves the running configuration to NVRAM.

Step 10 **reload**

Example:

```
Router# reload
```

Restarts the router to enable the feature set and the maximum throughput supported by the license.

Note: If you are installing an AX license, you do not need to restart the router.

Step 11 **show license detail**

Example:

The following is an example of the **show license detail** command showing an installed active license:

```
Router# show license detail
Index: 1        Feature: sec_100M                         Version: 1.0
        License Type: Permanent
        License State: Active, In Use
        License Count: Non-Counted
        License Priority: Medium
        Store Index: 0
        Store Name: Primary License Storage
```

Displays the license information.

Step 12 **platform hardware throughput level MB**{**10 | 100 | 1000 | 10000 | 250 | 2500 | 50 | 500 | 5000**}

Example:

```
Router(config)# platform hardware throughput level 500
```

(Optional) Changes the maximum throughput level.

Note: After issuing this command, you do not need to restart the router.

What to do next

Repeat these steps for each license available for your PAK.

Configuring an Interface for 10 Gbps Maximum Throughput

If you installed a license with maximum throughput with 10 Gbps, then additional configuration is required to obtain the 10 Gbps throughput on an interface. Perform the following additional steps.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface GigabitEthernet** *number*
4. **no negotiation auto**
5. **speed 10000**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface GigabitEthernet** *number* **Example:** `Router(config)# interface GigabitEthernet1`	Enters interface configuration mode.
Step 4	**no negotiation auto** **Example:** `Router(config-if)# no negotiation auto`	Disables the autonegotation protocol setting on the interface.
Step 5	**speed 10000** **Example:** `Router(config-if)# speed 10000`	Configures the interface speed to 10 Gbps.

Installing CSL Feature Add-on Licenses for Cisco IOS XE 3.13S and Later

Understanding the Cisco CSR 1000v Memory Allocation

You can use feature add-on licenses to add memory to the Cisco CSR 1000v/Cisco ISRv. Memory is allocated to both the IOSd component and the data plane component. The amount of the memory allocation is dependent on the licenses installed.

You can install multiple 4 GB add-on licenses. You can add 4 GB of additional memory by installing the broadband feature license and then install further 4 GB add-on licenses.

The following table lists how the memory is allocated depending on the amount of VM Memory and the feature licenses installed.

Note Restrictions apply when installing memory add-on licenses with a broadband feature license. For more information, see the I*nformation About Installing Broadband Feature License* and the *Installing Broadband Feature License* sections in this guide.

Note The Cisco CSR 1000v is no longer available with a VM Memory of either 2.5 GB or 6 GB.

Table 1: Cisco CSR 1000v Memory Allocation with Memory Add-on Licenses

VM Memory	Default Memory Allocation	One 4 GB add-on license or one broadband license	(Two 4 GB add-on licenses) or (one broadband license + one 4 GB add-on license)	(Three 4 GB add-on licenses) or (one broadband license + two 4 GB add-on licenses)
4 GB (Additional memory allocation using an add-on license or broadband license is not available for this level of VM memory.)	IOSd = 2.5 GBDataplane = 1.5 GB	NA	NA	NA
8 GB	IOSd = 2.5 GBDataplane = 1.5 GB	IOSd = 5.5G Dataplane = 2.5G	NA	NA
12 GB	IOSd = 2.5 GBDataplane = 1.5 GB	IOSd = 5.5G Dataplane = 2.5G	IOSd = 9.5G Dataplane = 2.5G	NA
16 GB	IOSd = 2.5 GBDataplane = 1.5 GB	IOSd = 5.5G Dataplane = 2.5G	IOSd = 9.5G Dataplane = 2.5G	IOSd = 13.5G Dataplane = 2.5G

Further Information about Memory Add-on Licenses

This section seeks to explain some misleading memory usage values that may be shown after installing add-on licenses. Installing add-on memory provides additional memory that is assigned to the main IOS-XE process (IOSd). For example, if you add three 4 GB add-on licenses you may gain approximately 11 GB memory. However, bear in mind that adding memory may not solve underlying issues with your configuration and the additional memory may not be necessary.

If you add two or three memory add-on licenses, you may see misleading messages such as the following error log message:

```
%PLATFORM-3-ELEMENT_CRITICAL: R0/0: smand: RP/0: Used Memory value 96% exceeds critical
level 93%
```

A similar high usage value is displayed by a **show platform** command such as **show platform software status control-processor brief**. See Example 1 below.

Example 1

In this example a Cisco CSR 1000v running Cisco IOS XE 16.6.2 has 2 x 4 GB memory add-on licenses. The displayed information indicates a critically high memory usage.

```
# show platform software status control-processor brief
...
Memory (kB)
```

```
 Slot  Status    Total     Used (Pct)     Free (Pct) Committed (Pct)
  RP0 Critical 12242316 11775260 (96%)   467056 ( 4%)  12255384 (100%)      << 96% Critical
```

If you were able to have access to the underlying Linux system you could find that only less memory than 96% is being used. For example, internally the following Linux command shows only 81% usage—based on used memory as a percentage of total memory.

```
free -m
              total        used        free      shared   buff/cache   available
Mem:          11955        9708          76         758        2169        1383
```

If you were then to add a third 4 GB add-on license, making a total of three add-on licenses, the 96% memory usage that is displayed by the **show platform** command would not be significantly reduced.

If you use the `show processes memory sorted` command, as shown in Example 2 below, you get a better indication of the memory usage.

Example 2

This example shows the difference between using a Cisco CSR 1000v with no add-on licenses, and a Cisco CSR 1000v with two add-on licenses.

1. CSR 1000v with no add-on licenses.

```
# show processes memory sorted
...
Processor Pool Total: 2458193040 Used:  239241616 Free: 2218951424    << 239 MB used
```

2. CSR 1000v with two add-on licenses.

```
# show processes memory sorted
...
Processor Pool Total: 9625210000 Used: 1231337528 Free: 8393872472    <<  1.2 GB used
```

This shows that even considering the additional 700 MB extra processing needs, the memory that is being used is quite low. Therefore, using two add-on licenses for this processing requirement may be unnecessary.

Installing Memory Add-on License

Beginning with Cisco IOS XE 3.13S, you can add memory in 4 GB increments to enable control plane scaling using the memory add-on license (L-CSR-MEM-4G=). The following prerequisites apply:

- The base feature license must be installed.
- The VM must have enough memory allocated to accommodate the additional memory. For more information, see the table in the section *Understanding the Cisco CSR 1000v Memory Allocation* in this guide.

SUMMARY STEPS

1. Obtain the PAK.
2. **enable**
3. **show license udi**
4. Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal: http://www.cisco.com/go/license
5. **show platform software vmemory info**
6. **configure terminal**
7. **platform memory add** *memory*

8. **end**
9. **license install** *stored-location-url*
10. **write memory**
11. **reload**
12. **show license detail**
13. **show platform software vmemory info**

DETAILED STEPS

	Command or Action	Purpose
Step 1	Obtain the PAK.	The PAK is provided to you when you order or purchase the right to use a feature set. • The PAK serves as a receipt and is used as part of the process to obtain a license.
Step 2	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 3	**show license udi** **Example:** `Router# show license udi`	Displays all the UDI values that can be licensed in a system. • You need the UDI of the device as part of the process to obtain a license.
Step 4	Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal: http://www.cisco.com/go/license	After entering the appropriate information, you will receive an e-mail containing the license information that you can use to install the license: • Copy the license file received from the Cisco Product License Registration portal to the appropriate file system on the device.
Step 5	**show platform software vmemory info**	Verifies the current memory allocation on the Cisco CSR 1000v/Cisco ISRv. The display shows the memory upgrade license limit, indicating the maximum amount of additional memory you can add.
Step 6	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 7	**platform memory add** *memory* **Example:** `Router(config)# platform memory add 4096`	Adds the memory allocation to the router to accommodate added memory license(s). Add 4096 MB for each memory license you are planning to install. For example, if you plan to add three memory licenses, you would add 12288 MB of memory.

	Command or Action	Purpose
Step 8	**end** **Example:** `Router(config)# end`	Exits configuration mode.

Step 9	**license install** *stored-location-url*
	Example:
	`Router# license install bootflash:90NVHJ3C26E_20140724194119019.lic`
	Example:
	`4096 MB memory has been added to the system`
	Example:
	`Execute 'write memory' to persist this change`
		Installs the memory add-on license.

Step 10	**write memory** **Example:** `Router# write memory`	Saves the running configuration to NVRAM.
Step 11	**reload** **Example:** `Router# reload`	Restarts the router to enable the memory add-on license to be activated.
Step 12	**show license detail** **Example:** `Router# show license detail`	Displays the license information to verify the installation of the memory license(s).

Step 13	**show platform software vmemory info**
	Example:
	`Router# show platform software vmemory info`
	`Memory Upgrade Limits:`
	`Total System Memory:3894 MB`
	`Memory From Upgrade Licenses:N/A(Smart License Enabled)`
	`Memory From Feature Licenses:N/A(Smart License Enabled)`
	`Memory Available For Upgrade:`
	`Available System Memory:0 MB`
	`Available Upgrade Licensed Memory:N/A(Smart License Enabled)`
	`Available Feature Licensed Memory:N/A(Smart License Enabled)`
	`Current Memory Allocation:`
		Verifies the updated memory allocation on the router.

	Command or Action	Purpose
	IOSD:2358 MB (default) + 0 MB upgrade Data Plane:1536 MB (default) + 0 MB upgrade	

Example

The following is an example of the **show license** command with details of a memory add-on license shown:

```
Router# show license
Index 1 Feature: ax
Index 2 Feature: mem_4G
        Period left: Life time
        License Type: Permanent
        License State: Active, In Use
        License Count: 1/1/0  (Active/In-use/Violation)
        License Priority: Medium
```

Information About Installing Broadband Feature License

The Cisco CSR 1000v/ Cisco ISR v support the Broadband Network Gateway feature set and the Intelligent Services Gateway feature set. The required broadband feature license (For the Cisco CSR 1000v: L-CSR-BB-1K=) provides up to 4 GB of additional memory and support for up to 1000 broadband sessions.

The following restrictions apply:

- The APPX feature license with a minimum of 1 Gbps maximum throughput must be installed.
- You can install multiple broadband feature licenses to increase the number of broadband sessions. However, installing additional broadband feature licenses will not add more memory. To add more memory beyond the 4 GB installed with the first broadband feature license, you must install a separate memory add-on license.
- If both a broadband feature license and memory add-on licenses are installed, then the broadband license takes higher priority than any memory add-on licenses installed. When the Cisco CSR 1000v/ Cisco ISRv is reloaded, the broadband feature license takes effect first, before any installed memory add-on licenses.
- We recommend that you install the broadband feature license before installing any memory add-on licenses.
- The VM must have enough memory allocated to accommodate the additional memory. See Understanding the Cisco CSR 1000v Memory Allocation, on page 8 for more information.

For more information about configuring broadband support, see Broadband Access Aggregation and DSL Configuration Guide and Intelligent Services Gateway Configuration Guide.

Installing Broadband Feature License

SUMMARY STEPS

1. Obtain the PAK.
2. **enable**

3. **show license udi**
4. Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal http://www.cisco.com/go/license
5. **show platform software vmemory info**
6. **configure terminal**
7. **platform broadband** {**1K** | **2K** | **3K** | **4K** | **5K** | **6K** | **7K** | **8K**}
8. **platform memory add** *memory*
9. **end**
10. license install *stored-location-url*
11. **write memory**
12. **reload**
13. **show license detail**
14. **show platform software vmemory info**
15. (Optional) Install memory add-on licenses as needed. For more information, see the *Installing a Memory Add-on License* section in this guide.

DETAILED STEPS

	Command or Action	Purpose
Step 1	Obtain the PAK.	The PAK is provided to you when you order or purchase the right to use a feature set. • The PAK serves as a receipt and is used as part of the process to obtain a license.
Step 2	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 3	**show license udi** **Example:** `Router# show license udi`	Displays all the UDI values that can be licensed in a system. • You need the UDI of the device as part of the process to obtain a license.
Step 4	Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal http://www.cisco.com/go/license	After entering the appropriate information, you will receive an e-mail containing the license information that you can use to install the license: • Copy the license file received from the Cisco Product License Registration portal to the appropriate file system on the device.
Step 5	**show platform software vmemory info**	Verifies the current memory allocation on the router. The display shows the memory upgrade license limit, indicating the maximum amount of additional memory you can add.
Step 6	**configure terminal** **Example:**	Enters global configuration mode.

	Command or Action	Purpose
	`Router# configure terminal`	
Step 7	**platform broadband** {**1K** | **2K** | **3K** | **4K** | **5K** | **6K** | **7K** | **8K**} **Example:** `Router(config)# platform broadband 1K`	Adds support for the number of broadband sessions to accommodate the added broadband feature license(s). You can add 1000 sessions for each broadband feature license you are planning to install. For example, if you plan to add two broadband feature licenses, enter the value as 2K.
Step 8	**platform memory add** *memory* **Example:** `Router(config)# platform memory add 4096`	(Optional) Adds the memory allocation to the router to accommodate added memory license(s). Add 4096 MB for each memory license you are planning to install. For example, if you plan to add two memory licenses, add 8192 MB of memory. **Note** The broadband feature license adds 4 MB of additional memory. If you want to add more memory, you must use this command. Adding more broadband feature licenses does not add more memory.
Step 9	**end** **Example:** `Router(config)# end`	Exits configuration mode.

Step 10	license install *stored-location-url*
	Example:
	`Router# license install bootflash:90NVHJ3C26E_20140724194119019.lic`
	Example:
	`bootflash:90NVHJ3C26E_20140724194119019.lic`
	Example:
	`4096 MB memory has been added to the system`
	Example:
	`Execute 'write memory' to persist this change`
		Installs the broadband feature license and any additional memory add-on licenses.

Step 11	**write memory** **Example:** `Router# write memory`	Saves the running configuration to NVRAM.
Step 12	**reload** **Example:**	Restarts the router to enable the memory add-on license to be activated.

	Command or Action	Purpose
	`Router# reload`	
Step 13	**show license detail** **Example:** `Router# show license detail`	Displays the license information to verify the installation of the broadband feature license(s) and memory license(s).
Step 14	**show platform software vmemory info**	Verifies the updated memory allocation on the router.
Step 15	(Optional) Install memory add-on licenses as needed. For more information, see the *Installing a Memory Add-on License* section in this guide.	

Example

The following is an example of the **show license** command showing details of a broadband feature license:

```
# show license | begin bb
Index 76 Feature: bb_1K
Period left: Life time
License Type: Permanent
License State: Active, In Use
License Count: 1/1/0  (Active/In-use/Violation)
License Priority: Medium
Index 77 Feature: mem_4G
```

Troubleshooting CSL License Issues

Determining the License Status

You can install multiple licenses on a Cisco CSR 1000v/ ISRv. To determine if a license is active, enter the **show license** or **show license detail** command. The display indicates the license status. The following are the possible states for the license:

- Active, In Use

  This state indicates that the license is active and is in use by the Cisco CSR 1000v.

- Active, Not in Use

  This state indicates that the license is installed on the Cisco CSR 1000v, but is not currently being used.

- Inactive

  This state indicates that the license is installed on the Cisco CSR 1000v but is no longer valid. For example, a license that has reached the end of the subscription term is shown as inactive.

The following example shows that a Cisco CSR 1000v has two licenses installed: an AX technology license and a Security technology license:

```
router# show license detail

Index: 1        Feature: ax_1G                          Version: 1.0        License Type:
 Paid Subscription        Start Date:         N/A, End Date: Nov 10 2014        License
State: Active, In Use        License Count: Non-Counted        License Priority: Medium
     Store Index: 0        Store Name: Primary License StorageIndex: 2        Feature:
sec_1G                          Version: 1.0        License Type: Permanent        License
 State: Active, Not in Use       License Count: Non-Counted       License Priority: Medium
        Store Index: 1        Store Name: Primary License Storage
```

The AX technology license is shown as Active and in use, while the Security technology license is Active but not in use. To use the Security technology license, the **license boot level** command needs to be configured to "security" and the Cisco CSR 1000v must then be reloaded.

The following example of the **show version** command shows that the Cisco CSR 1000v has an AX technology license installed, but that the license boot level command has been set to "security", but the Cisco CSR 1000v has not yet been reloaded.

```
router# show version | inc Level

  License Level: ax   Next reload license Level: security
```

Migrating Technology Package Licenses to Cisco IOS XE 3.13S

Starting with Cisco IOS XE 3.13S, the names of the technology package licenses changed as shown below.

- The Standard technology package was changed to the IPBase technology package.
- The Advanced technology package was changed to the Security technology package.
- The Premium technology package was changed to the AX package.

The base feature content for each license is the same as previously, but the names as shown in the licenses and display output have changed. If you migrated either a Standard or Advanced technology package license from a previous version to Cisco IOS XE 3.13S, then the show version and show license commands display the old license names, which is expected behavior. The new license names display when you enter the **show running configuration** command.

In the following example, the **show running configuration** command following the migration shows the new "security" technology package :

```
Router# show running | include level
license boot level security
```

However, in the **show version** output, the migrated license displays as the old "advanced" technology package name, as shown in the following example:

```
Router# show version | include License Level
License Level: advanced
```

In the **show license detail** output, the feature license also shows the old advanced license package name, as shown in the following example:

```
Router# show license detail
Index: 1        Feature: adv_100M                         Version: 1.0
        License Type: Permanent
        License State: Active, In Use
        License Count: Non-Counted
        License Priority: Medium
        Store Index: 0
        Store Name: Primary License Storage
```

No further configuration is required. To verify the correct feature set name for the migrated license, use the **show running configuration** command.

Determining the AWS License Type

When you deploy a Cisco CSR 1000v instance from a Cisco CSR 1000v Amazon Machine Image (AMI), the license that is displayed differs depending on whether you deployed a Bring Your Own License (BYOL) or an hourly-usage license.

- If the **show license** command shows the license as “advance, internal_service” or a similar designation, then the instance uses an hourly-usage license purchased on Amazon Web Services.

The following example displays the license information for an hourly-usage instance:

```
router# show license
Index 1 Feature: ax           Index 2 Feature: internal_service
```

- If the **show license** command shows a list of supported licenses with various throughput levels, then the instance is a BYOL instance.

The following example displays the license information for a BYOL instance:

```
router# show license
Index 1 Feature: advanced
Index 2 Feature: standard
Index 3 Feature: ax
Index 4 Feature: security
Index 5 Feature: lite
Index 6 Feature: appx
Index 7 Feature: ipbase
Index 8 Feature: prem_10M
Index 9 Feature: prem_50M
Index 10 Feature: prem_100M
Index 11 Feature: prem_250M
Index 12 Feature: prem_500M
Index 13 Feature: prem_500M_8G
Index 14 Feature: prem_1G
Index 15 Feature: prem_1G_16G
Index 16 Feature: prem_2500M
Index 17 Feature: prem_5G
Index 18 Feature: prem_10G
Index 19 Feature: prem_200G
Index 20 Feature: ax_10M
Index 21 Feature: ax_50M
Index 22 Feature: ax_100M
Index 23 Feature: ax_250M
Index 24 Feature: ax_500M
Index 25 Feature: ax_500M_8G
Index 26 Feature: ax_1G
```

- The **license boot level** and **platform hardware throughput-level** commands are not available with hourly-usage license. These commands are only supported on Cisco CSR 1000v instances with BYOL licenses.

Cisco Smart Licensing

Note If you are using CSR1000v release 16.10.1 or later, for Smart Licensing information, refer to the Smart Licensing Guide for Access and Edge Routers.

Beginning with Cisco IOS XE Release 3.15S, the Cisco CSR 1000v/ Cisco ISRv support activation using Cisco Smart Licensing.

- To use Cisco Smart Licensing, you must first configure the Call Home feature and obtain Cisco Smart Call Home Services.
- For Cisco IOS XE 3.15S and later, and IOS XE Denali 16.3 and later, the following Cisco IOS XE technology packages are supported: IPBase, Security, AX and APPX
- Cisco Smart Licensing uses the Cisco Smart Software Manager for managing licenses. To access the Cisco Smart Software Manager, use the following URL: https://software.cisco.com/#module/SmartLicensing

For more information about Cisco Smart Software Manager, see the Cisco Smart Software Manager User Guide , which is accessible from the Cisco Smart Software Manager tool.

Prerequisites for Cisco Smart Licensing

Before enabling Cisco Smart Licensing on the router, Cisco Smart Call Home must be configured by following the steps in Configuring Call Home for Smart Licensing, on page 20.

Note For further information on Smart Call Home, see Obtaining Smart Call Home Services and Configuring and Enabling Smart Call Home.

Restrictions for Cisco Smart Licensing

- You cannot use the Web UI to configure SLP related commands for Cisco CSR1000V or Cisco ISRv 17.3.x and earlier versions.

Configuring Call Home for Smart Licensing

Describes how to configure and activate Call Home specifically for Smart Licensing. This is a prerequisite for configuring Smart Licensing on the Cisco CSR 1000v/ ISRv.

Note For more information in general about configuring Call Home, see Configuring Call Home for the Cisco CSR 1000v.

Step 1 **configure terminal**

Example:

```
Router# configure terminal
```

Enters configuration mode.

Step 2 **service call-home**

Example:

```
Router(config)# call-home
```

Activates the call-home feature.

Step 3 **call-home**

Example:

```
Router(config)# call-home
```

Enters the Call Home configuration submode.

Step 4 **profile** *name*

Example:

```
Router(config-call-home)# profile
 CiscoTAC-1
```

Enters the Call Home destination profile configuration submode for the specified destination profile. If the specified destination profile does not exist, it is created.

Step 5 **destination transport-method http**

Example:

```
Router(cfg-call-home-profile)# destination transport-method email
```

Enables the HTTP message transport method.

Step 6 **no destination transport-method email**

Example:

```
Router(cfg-call-home-profile)# no destination transport-method email
```

Disables email as the transport method.

Step 7 **destination address http** *url*

url = https://tools.cisco.com/its/service/oddce/services/DDCEService —address of the Cisco Smart Call Home Server.

Example:

```
Router(cfg-call-home-profile)# destination address email
https://tools.cisco.com/its/service/oddce/services/DDCEService
```

Configures the destination email address or URL to which Call Home messages are sent.

Note When entering a destination URL, include either **https://** or **http://** , depending on whether the server is a secure server, or not.

Enabling Cisco Smart Licensing

To enable Cisco Smart Licensing and register your device, perform the following steps:

Step 1 Execute the **configure terminal** command.

Example:

```
Router# configure terminal
```

Enters the global configuration mode.

Step 2 Execute the **license smart enable** command.

Example:

```
Router(config)# license smart enable
```

This command enables Cisco Smart Licensing and disables Cisco Software Licensing (CSL).

Step 3 To further establish connectivity, perform the following optional steps:

a) Execute the **ip http client source-interface <interface>** command.
b) Execute the **ip domain lookup source-interface <interface>** command.
c) Execute the **ip name-server vrf mgmt <ip address>** command.

Step 4 **exit**

Example:

```
Router(config)# exit
```

Exits the configuration mode.

What to do next

After you enable the Cisco Smart Licensing, the Cisco CSR 1000v instance is no longer in the evaluation mode. The technology level and the throughput level supported by your license takes effect. For more information about managing the technology package and throughput license attributes, see Understanding the License-Based Restriction on Aggregate Bandwidth, on page 56 and Managing Throughput Notifications, on page 58.

Use the **show running-config** command to verify whether the Cisco Smart Call Home is enabled. The following configuration should be included:

```
call-home
  profile "CiscoTAC-1"
  active
  destination transport-method http
  no destination transport-method email
  destination address http https://tools.cisco.com/its/service/oddce/services/DDCEService
```

Verify that the **destination address** command points to the URL of the Cisco Smart Software Agent as shown above. If the URL is not configured, you must manually configure the **destination address http** command to point to the URL.

After the connectivity is established, register the router with the Cisco Licensing Cloud. For example, see the Registering the Router with the Cisco Licensing Cloud, on page 40 section.

Smart Licensing System Messages

This section lists the smart licensing system messages for the Cisco CSR 1000v and Cisco ISRv. The more severe system messages are listed first. For more information on system messages, see System Message Logging. For more information on system logging commands, see the Cisco IOS Configuration Fundamentals Command Reference.

%SMART_LIC-2-PLATFORM_ERROR

Message:

```
Smart Licensing has encountered an internal software error. Contact TAC: %s
```

Explanation:

Smart Licensing Agent has encountered an internal problem with the platform.

Recommended Action:

Contact Cisco TAC.

%SMART_LIC-2-XDM_DISPATCH_LOOP_FAILURE

Message:

```
SmartAgent Admin Init Failed due to failure at XdmDispatchLoop in creating handle
```

Explanation:

This is an internal error that occurred during scheduler initialization, when trying to create an xdm handle.

Recommended Action:

Contact Cisco TAC.

%SMART_LIC-3-APPHA_DUPLICATED_INSTANCE

Message:

```
The Application, is trying set HA information for a duplicate instance.
```

Explanation:

The application is attempting to set the HA information for an entitlement instance (handle) when another duplicate instance already exists (with same entitlement tag, appHaName and appHaInstanceID).

%SMART_LIC-3-APPHA_DUPLICATED_INSTANCE

Message:

```
The Application, is trying set HA information for a duplicate instance.
```

Explanation:

The application is attempting to set the HA information for an entitlement instance (handle) when another duplicate instance already exists (with same entitlement tag, appHaName and appHaInstanceID).

%SMART_LIC-3-PLR_CONFIG_OUT_OF_SYNC

Message:

```
Trusted Store PLR Enable flag not in sync with System Configuration, TS \%s Config \%s
```

Explanation:

The Smart Licensing configuration does not match the value of the PLR enable flag in Trusted Store. This can happen if a configuration is copied onto the system and a reload occurs. If the new configuration does not contain the Smart Licensing Enable command, the value in Trusted Store does not match.

Recommended Action:

Apply the desired Smart Licensing PLR Configuration Command and persist the configuration.

%SMART_LIC-3-NOT_AUTHORIZED

Message:

```
The entitlement \%s in Not Authorized to be used. Reason: \%s
```

Explanation:

You are using a license without authorization.

Recommended Action:

Go to the Smart Licensing portal to view your entitlements and attempt to find out why you are not authorized to use this license.

%SMART_LIC-3-CONFIG_NOT_SAVED_TSCLEAR

Message:

```
The smart agent for Licensing will now be disabled because the config was not saved before
the reload
```

Explanation:

During Smart Agent initialization, if the Smart Agent state is registered and the config with the smart license enabled flag was saved before the reboot, then the configuration was not saved before the reload.

Recommended Action:

Save the configuration before reloading.

%SMART_LIC-3-AUTH_RENEW_FAILED

Message:

```
Authorization renewal with the Cisco Smart Software Manager or satellite : \%s
```

Explanation:

The Authorization renew request failed. An automatic retry occurs.

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite.

%SMART_LIC-3-AGENT_DEREG_FAILED

Message:

```
Smart Agent for Licensing DeRegistration with Cisco Smart Software Manager or satellite
failed: \%s
```

Explanation:

Smart Licensing De-registration failed. This may have been caused due to a network connection failure to the Cisco Smart Software Manager or satellite. The local registration information on the device has been removed. The registration information on the Cisco Smart Software Manager or satellitehas not been removed

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite

%SMART_LIC-3-AGENT_REG_FAILED

Message:

```
Smart Agent for Licensing Registration with the Cisco Smart Software Manager or satellite
failed: %s
```

Explanation:

Smart Licensing registration failed. Examine the included error string for a more detailed reason for the failure. This could be due to an invalid ID token or if the device is already registered.

Recommended Action:

If the ID token is invalid, it may have expired. Another reason is that you may be using an ID token from Cisco Smart Software Manager but you are registering with a CSSM satellite. If the device is already registered you may use the force option to force the registration with a new ID token. Please verify your Call Home settings and that the device has connectivity to the Cisco Smart Software Manager or CSSM satellite.

%SMART_LIC-3-AGENT_DEREG_FAILED

Message:

```
Smart Agent for Licensing DeRegistration with Cisco Smart Software Manager or satellite
failed: %s
```

Explanation:

Smart Licensing De-registration failed. This may have been caused by a network connection failure to the Cisco Smart Software Manager or satellite. The local registration information on the device has been removed. The registration information on the Cisco Smart Software Manager or satellite has not been removed.

Recommended Action:

Please verify your Call Home settings and that the device has connectivity to the Cisco Smart Software Manager or satellite.

%SMART_LIC-3-CONVERT_LIC_FAIL

Message:

```
\%s Failed to convert \%s: \%s
```

%SMART_LIC-3-UTILITY_REPORT_FAILED

Message:

```
Smart Agent for Licensing Utility has failed to send usage Report
```

%SMART_LIC-3-EVAL_EXPIRED

Message:

```
Evaluation period expired
```

Explanation:

Your evaluation period has expired. Some features may have restricted usage.

Recommended Action:

You must obtain a new ID token from the Cisco Smart Software Manager or satellite and register the device.

%SMART_LIC-3-OUT_OF_COMPLIANCE

Message:

```
One or more entitlements are out of compliance
```

Explanation:

The customer is using a license that they have not purchased or they are using more licenses than they have purchased.

Recommended Action:

You can go to the Smart Licensing portal and view your entitlements, to try and find out why the entitlements are out of compliance.

%SMART_LIC-3-INVALID_ROLE_STATE

Message:

```
The current role is not allowed to move to the new role: Current \%s New \%s
```

Explanation:

From the last role event, we can only move to certain roles. The device has moved to a role which the Smart Agent cannot follow.

Recommended Action:

Report this problem to Cisco

%SMART_LIC-3-DEPRECATED_API

Message:

```
The Deprecated function \%s has been called. This call should be replaced by \%s
```

Explanation:

This error indicates the Cisco platform team is using deprecated API functions. The platform code is calling a deprecated function. The code needs to be changed to call the new function.

Recommended Action:

Contact Cisco TAC.

%SMART_LIC-3-BAD_MODE

Message:

```
An unknown mode was specified: \%d
```

Explanation:

An invalid entitlement enforcement mode was received by the smart agent in the process of logging a syslog message. This is an internal error and should be reported to Cisco.

Recommended Action:

This is a Smart Licensing internal error. Please report this to Cisco TAC.

%SMART_LIC-3-UTILITY_EXPIRED

Message:

```
Smart Agent for Licensing Utility certificate has expired
```

Explanation:

Smart Agent for Licensing utility certificate has expired.

%SMART_LIC-3-UTILITY_RENEW_FAILED

Message:

```
Smart Agent for Licensing Utility certificate renewal failed
```

Explanation:

Smart Agent for Licensing Utility cert renew failed, this will occur once per day until the renewal is successful or the current certificate expires.

%SMART_LIC-3-INVALID_TAG

Message:

```
The entitlement tag is invalid: \%s
```

Explanation:

The entitlement tag for a license is not defined in the Cisco Smart Software Manager. This is a Cisco internal problem and should be reported to Cisco.

Recommended Action:

Report this error to Cisco

%SMART_LIC-3-BAD_NOTIF

Message:

```
A bad notification type was specified: \%d
```

Explanation:

This is a Cisco internal error. Report it to Cisco TAC.

Recommended Action:

Report this error to Cisco TAC.

%SMART_LIC-3-AGENT_REG_FAILED

Message:

```
Smart Agent for Licensing Registration with the Cisco Smart Software Manager or satellite
failed: \%s
```

Explanation:

Smart Licensing registration failed. The included error string should give a more detailed reason for the failure. This may have been due to an invalid ID token or because the device is already registered

Recommended Action:

If the ID token was invalid it may have expired or you may be using an ID token from the Smart Software Manager and you are registering with a satellite. If the device is already registered you can use the force option to force the registration with a new ID token. Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite.

%SMART_LIC-3-ID_CERT_EXPIRED

Message:

```
Registration period has expired. Smart Licensing will transition to the unregistered state.
Please re-register this product to correct the problem.
```

Explanation:

The current time is outside the valid registration period in the ID certificate. This could be caused by a change in the system clock or multiple communications failures with the Cisco Smart Software Manager or satellite.

Recommended Action:

Please check the Smart Call Home settings and network connectivity to the Cisco Smart Software Manager or satellite. Also verify that your system clock is correct.

%SMART_LIC-3-ID_CERT_EXPIRED_WARNING

Message:

```
This device's registration will expire in \%s.
```

Explanation:

The registration for this device will expire at the specified time. This usually indicates a communications failure with the Cisco licensing authority.

Recommended Action:

Please verify your Call Home settings and that the device has connectivity to the Cisco Smart Software Manager or satellite.

%SMART_LIC-3-APPHA_DUPLICATED_PEER

Message:

```
The Application HA Cluster already have a member with given identity. Use the show license
usage command to see more details.
```

Explanation:

When setting up peer informations for an entitlement that supports attribute, the given peer information already exists. One of the devices may not be configured correctly or that the logic that is supposed to remove peer information is not working correctly.

%SMART_LIC-3-RESERVE_HA_FAILURE

Message:

```
The license reservation information on the active and standby does not match. Licensing HA
will not work properly: \%s
```

Explanation:

The license reservation configuration is not the same on both the active and standby. If the standby takes over as active, you will not have the same licenses available and your device may not work properly.

Recommended Action:

Change the reservation configuration in either of the nodes or both of the nodes so that they match each other.

%SMART_LIC-3-CONFIG_OUT_OF_SYNC

Message:

```
Trusted Store Enable flag not in sync with System Configuration, TS \%s Config \%s
```

Explanation:

The Smart Licensing configuration does not match the value of the enable flag in Trusted Store. This can happen if a configuration is copied onto the system and a reload occurs. If the new configuration does not contain the Smart Licensing Enable command, the value in Trusted Store does not match.

Recommended Action:

Apply the desired Smart Licensing Configuration Command and persist the configuration.

%SMART_LIC-3-REG_EXPIRED_CLOCK_CHANGE

Message:

```
Smart Licensing registration has expired because the system time was changed outside the
validity period of the registration period. The agent will transition to the un-registered
state in 60 minutes.
```

Explanation:

The system clock has been changed so that it is now outside the valid registration period. If the clock is reset to a value inside the registration validity period of 1 hour, smart licensing continues to function normally. If the clock is not reset, the device becomes de-registered and a new id token must be obtained to re-register the device. The registration validity period is defined by the start and end date in the ID certificate. Use the **show license tech support** command to get the ID certificate information.

Recommended Action:

Set the system clock back to the correct date and time.

%SMART_LIC-3-ROOT_CERT_MISMATCH_PROD

Message:

```
Certificate type mismatch
```

Explanation:

Smart Agent received an incorrect certificate for validation. Please contact your product support team.

%SMART_LIC-3-APPHA_MISSING_PEER

Message:

```
The Application HA Cluster do not have a member with given identity. Use the 'show license
usage' command to see the exact error.
```

Explanation:

When removing peer information for an entitlement that supports the attribute, the given peer information does not exist. This means that one of the devices may not be configured correctly or that the logic that is supposed to add/update peer information is not working correctly.

%SMART_LIC-3-APPHA_ADD_ITSELF

Message:

```
The Application, is trying to add itself as its own Application HA peer.
```

Explanation:

When adding peer information for an entitlement that supports an attribute, the peer information contains the same data as its own HA attribute. This means that it has tried to add itself as its own peer.

%SMART_LIC-3-CERTIFICATE_VALIDATION

Message:

```
Certificate validation failed by smart agent: \%s
```

Explanation:

The ID certificate validation failed during a reboot, registration or renewal. The included error message should give more information about the failure.

%SMART_LIC-3-HOT_STANDBY_OUT_OF_SYNC

Message:

```
Smart Licensing agent on hot standby is out of sync with active Smart Licensing agent
```

Explanation:

The Smart Licensing Agent on hot standby failed to process the data necessary to stay in sync with the active agent. If a switch over occurs the the new active agent will not be in the same state as the current active agent. The configuration does not match the value of the enable flag in Trusted Store. This can happen if a configuration is copied onto the system and a reload occurs. If the new configuration does not contain the Smart Licensing Enable command, the value in Trusted Store will not match.

%SMART_LIC-3-ENTITLEMENT_RENEW_FAILED

Message:

```
Entitlement authorization with Cisco licensing cloud failed: \%s
```

Explanation:

The device has failed to communicate with Cisco to renew the entitlement authorization.

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite

%SMART_LIC-3-COMM_FAILED

Message:

```
Communications failure with the Cisco Smart Software Manager or satellite : \%s
```

Explanation:

The device communication with the Cisco Smart Software Manager or satellite failed.

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite

%SMART_LIC-3-CONVERT_FAILED

Message:

```
\%s License conversion failed: \%s
```

%SMART_LIC-3-ID_CERT_RENEW_NOT_STARTED

Message:

```
ID certificate start date not reached yet
```

Explanation:

The device registration failed. The ID Certificate start date is later than the device current time.

Recommended Action:

Please adjust your device clock to be correct, and retry the registration again.

%SMART_LIC-3-ID_CERT_RENEW_FAILED

Message:

```
Automatic registration renewal failed: \%s
```

Explanation:

The automatic ID certificate renewal failed. The included error message should give a better idea of what the failure was.

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite

%SMART_LIC-3-EVAL_EXPIRED_WARNING

Message:

```
Evaluation period expired on \%s
```

Explanation:

The device evaluation period will expire in the specified amount of time.

Recommended Action:

Register this device with the Cisco Smart Software Manager or satellite before the evaluation period expires.

%SMART_LIC-3-ROOT_CERT_MISMATCH_DEV

Message:

```
Certificate Mismatch: Development \%s Certificate being used with a Production Root
Certificate. Use the 'test license smart dev-cert enable' CLI to set the DEV root cert.
```

Explanation:

The Production Root Certificate is being used with Development certificates.

Recommended Action:

Please activate the Development Root Certificate from the CLI. (ie. 'test license smart dev-cert enable')

%SMART_LIC-4-CONFIG_NOT_SAVED

Message:

```
Smart Licensing configuration has not been saved
```

Explanation:

This is an informational message to remind you to save the configuration.

Recommended Action:

Save the configuration.

%SMART_LIC-4-HANDLE_ATTR_VERSION_MISMATCH

Message:

```
The handle attribute version between two devices are different. \%s
```

Explanation:

The devices inside a cluster do not have the same operational capability. This is not an issue if all devices only use the functionality that all members of a cluster support. However, it is good practice to have all devices in a cluster using the same software version.

%SMART_LIC-4-RESERVE_IN_PROGRESS

Message: `License Reservation process must be completed with the 'license smart reservation install' command. Reservation started on %s`

Recommended Action:

You must obtain a reservation authorization code from Cisco Smart Software Manager and install it on the device.

%SMART_LIC-4-IN_OVERAGE

Message: `One or more entitlements are in overage`

Explanation:

This is for information only. No action is necessary. You are still in compliance and within the overage amount as specified in your contract.

Recommended Action:

This message is informational only and no action is required.

%SMART_LIC-4-SMART_TRANSPORT_NOT_CONFIG

Message: `Smart Agent for Licensing Smart transport is not configured for utility reporting`

Explanation:

Smart Agent for Licensing Utility is enabled and there is a subscription, but Smart transport is not configured.

%SMART_LIC-4-UTILITY_FQDN_MISMATCH

Message:

```
Smart Agent for Licensing Utility URL setting does not match the FQDN in the utility
certificate.
```

Explanation:

The Smart Agent for Licensing Smart licensing URL must match the FQDN embedded in the utility certificate.

Recommended Action:

Obtain a new utility certificate from Cisco.

%SMART_LIC-4-EVAL_WILL_EXPIRE_WARNING

Message:

```
Evaluation period will expire in \%s.
```

Explanation:

The device is operating within the evaluation period and this period ends in the specified amount of time.

Recommended Action:

Register this device with the Cisco Smart Software Manager or satellite before the evaluation period ends.

%SMART_LIC-4-EVAL_WILL_EXPIRE_WARNING

Message:

```
Evaluation period will expire in \%s.
```

Explanation:

The device is using the evaluation period which will expire in the specified time

Recommended Action:

Register this device with the Cisco Smart Software Manager or satellite before the evaluation period expires.

%SMART_LIC-5-IN_COMPLIANCE

Message: `All entitlements and licenses in use on this device are authorized.`

Explanation:

All your requested entitlements are authorized by Cisco licensing services.

Recommended Action:

This message is informational only and no action is required.

%SMART_LIC-5-COMM_RESTORED

Message:

```
Communications with the Cisco Smart Software Manager or satellite restored
```

Explanation:

Smart Agent communication with the Cisco Smart Software Manager or satellite has been restored.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-5-SYSTEM_CLOCK_CHANGED

Message:

```
Smart Agent for Licensing System clock has been changed
```

Explanation:

The system clock has changed and the Smart Agent for Licensing has updated its internal timers

Recommended Action:

This is informational only and no action is required

%SMART_LIC-5-UTILITY_RENEW_SUCCESS

Message:

```
Smart Agent for Licensing Utility certificate renewal successful
```

%SMART_LIC-5-IN_COMPLIANCE

Message:

```
All entitlements and licenses in use on this device are authorized
```

Explanation:

All customer requested entitlements are authorized by Cisco licensing services.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-5-EVAL_START

Message:

```
Entering evaluation period
```

Explanation:

The device is not registered with the Cisco Smart Software Manager or satellite and is using licenses. An evaluation period of 90 days is available

Recommended Action:

Register this device with the Cisco Smart Software Manager or satellite using an ID token

%SMART_LIC-5-COMM_INIT_FAILED

Message:

```
Failed to initialize communications with the Cisco Smart Software Manager or satellite: \%s
```

Explanation:

Smart Agent could not initialize communication with the Cisco Smart Software Manager or satellite.

Recommended Action:

Please verify your Call Home setting and check that the device has connectivity to the Cisco Smart Software Manager or satellite.

%SMART_LIC-5-AUTHORIZATION_EXPIRED

Message:

```
Authorization period expired
```

Explanation:

The device has not communicated with the Cisco Smart Software Manager or satellite for 90 days and the device has not automatically renewed the entitlement authorizations. Some features may restrict functionality

Recommended Action:

Please verify your Call Home setting and that the device has connectivity to the Cisco Smart Software Manager or satellite

%SMART_LIC-6-ID_CERT_RENEW_SUCCESS

Message:

```
Automatic registration renewal successful
```

Explanation:

Customer ID certificate has been renewed successfully

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-DISABLED

Message:

```
Smart Agent for Licensing disabled
```

Explanation:

Smart Agent has been disabled from either the CLI orbecause of a configuration mismatch

%SMART_LIC-6-AUTH_RENEW_SUCCESS

Message:

```
Authorization renewal with the Cisco Smart Software Manager or satellite. State=\%s
```

Explanation:

The automatic authorization renewal was successful

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-HA_ROLE_CHANGED

Message:

```
Smart Agent HA role changed to \%s.
```

Explanation:

Smart Agent role on HA RP has been changed to either active or standby.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-HA_CHASSIS_ROLE_CHANGED

Message:

```
Smart Agent HA chassis role changed to \%s.
```

Explanation:

Smart Agent chassis role on HA has been changed to either active or standby.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-AGENT_ALREADY_REGISTER

Message:

```
This device is already registered with the Cisco Smart Software Manager or satellite.
```

Explanation:

Smart Licensing on this device has already registered with the Cisco Smart Software Manager or satellite

Recommended Action:

Use the force option when registering or remove this device from your virtual account on the Cisco Smart Software Manager or satellite

%SMART_LIC-6-AGENT_ALREADY_DEREGISTER

Message:

```
Smart Agent is already Deregistered with the CSSM.
```

Explanation:

Smart Licensing has already de-registered with Cisco.

%SMART_LIC-6-EXPORT_CONTROLLED

Message:

```
Usage of export controlled features is \%s
```

Explanation:

This tells you if you are allowed to use export controlled features.

Recommended Action:

This is informational only and no action is required.

%SMART_LIC-6-HOSTNAME_MATCHED_UDI

Message:

```
The host name has been changed to match a field in the device identifier (UDI).Since the
device identifier is sent to Cisco this may bypass your host name privacy settings
```

Explanation:

The host name has been changed to match a field in the device identifier (UDI). Since the device identifier is sent to Cisco this may bypass your host name privacy settings.You can view the device identifier using the command: **show license udi**.

Recommended Action:

Change the host name so it does not include any fields in the device identifier.

%SMART_LIC-6-RESERVED_INSTALLED

Message:

```
\%s License Reservation Authorization code installed
```

Recommended Action:

This is informational only and no action is required.

%SMART_LIC-6-ENTITLEMENT_RENEW_SUCCESS

Message:

```
Entitlement authorization renewal with Cisco licensing cloud successful
```

Explanation:

Authorization renewal request is successful.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-RESERVE_RETURNED

Message:

```
\%s License Reservation returned. Smart Agent is now unregistered.
```

Recommended Action:

This is informational only and no action is required.

%SMART_LIC-6-RESERVE_CANCELED

Message:

```
\%s License Reservation request canceled. Smart Agent is now unregistered.
```

Explanation:

Sent when you cancel a reservation request by using the **reservation cancel** command.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-RESERVE_AUTH_FAILED

Message:

```
Failed to validate the \%s Reservation Authorization Code. Changing to the unregistered
state.
```

Explanation:

The reservation authorization code is not valid on this device

%SMART_LIC-6-RESERVE_HA_MISMATCH

Message:

The reserved licenses on the active and standby do not match. Use the `show license status` command to see the error details.

Explanation:

The Licenses reserved using the Specified License Reservation (SLR) feature in Smart Licensing and installed on the active and standby or member devices in an HA configuration are not the same. If the standby takes over as active you will not have the same licenses available and your device may not work properly.

%SMART_LIC-6-PLR_DISABLED_INIT_COMM

Message:

```
Permanent License Reservation has been disabled. Please reboot the system to initialize
Smart Licensing communications with Cisco.
```

Explanation:

During bootup, Smart Licensing communication is not initialized if Permanent License Reservation (PLR) is enabled. To enable Smart Licensing communication with Cisco when PLR is disabled, the system needs to be rebooted.

%SMART_LIC-6-CONVERT_START

Message:

```
Smart License Conversion has started
```

%SMART_LIC-6-CONVERT_LIC_SUCCESS

Message:

```
\%s License \%s has been converted to \%s with a count of \%d
```

%SMART_LIC-6-CONVERT_LIC_ALREADY

Message:

```
\%s License \%s has been converted to \%s with a count of \%d
```

%SMART_LIC-6-CONVERT_SUCCESS

Message:

```
\%s Smart License Conversion successful
```

%SMART_LIC-6-CONVERT_ALREADY

Message:

```
\%s Smart License Conversion successful
```

%SMART_LIC-6-THIRDPARTY_MODE_ENABLED

Message:

```
Smart Agent for Licensing is in Thirdparty Mode
```

Explanation:

Smart Agent for Licensing is in thirdparty mode, and ready to collect and process RUM reports

%SMART_LIC-6-THIRDPARTY_MODE_DISABLED

Message:

```
Smart Agent for Licensing is out of Thirdparty Mode
```

Explanation:

Smart Agent for Licensing is out of thirdparty mode, and has stopped collecting and processing RUM reports.

%SMART_LIC-6-UTILITY_STARTED

Message:

```
Smart Agent for Licensing Utility has started sending usage reports
```

Explanation:

Smart Agent for Licensing utility has been enabled and is sending usage reports.

%SMART_LIC-6-UTILITY_STOPPED

Message:

```
Smart Agent for Licensing Utility has stopped sending usage reports: \%s
```

Explanation:

Smart Agent for Licensing Utility is not available and no longer sending usage reports.

%SMART_LIC-6-AGENT_READY

Message:

```
Smart Agent for Licensing is initialized
```

Explanation:

Smart Agent for Licensing is fully initialized and ready for use.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-AGENT_ENABLED

Message:

```
Smart Agent for Licensing is enabled
```

Explanation:

Smart Agent for Licensing is enabled and ready to process licensing requests.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-6-AGENT_REG_SUCCESS

Message:

```
Smart Agent for Licensing Registration with the Cisco Smart Software Manager or satellite
```

Explanation:

Smart Licensing registration was successful.

%SMART_LIC-6-AGENT_DEREG_SUCCESS

Message:

```
Smart Agent for Licensing De-registration with the Cisco Smart Software Manager or satellite
was successful
```

Explanation:

Smart Licensing de-registration successful.

Recommended Action:

This is informational only and no action is required

%SMART_LIC-7-DAILY_JOB_TIMER_RESET

Message:

```
Daily job timer reset
```

Explanation:

This message is used only for testing and does not indicate an error

Recommended Action:

This is informational only and no action is required

Registering the Router with the Cisco Licensing Cloud

Note If you are registering the router and using CSSM satellite, go to the following section instead: Registering the Router with the Cisco Licensing Cloud (CSSM satellite), on page 42.

After you have enabled Cisco Smart Licensing, you must register the router with Cisco. Using the ID token, the license agent on the router registers the product with Cisco and then receives back an identity certificate. This certificate is used for all future communications with Cisco. The license agent on the router automatically renews the registration information with Cisco every 30 days. This registration step is performed once for each product instance.

Procedure

	Command or Action	Purpose

Step 1	**license smart register idtoken** *id-token*
	Example:
	`Router# license smart register idtoken YjBkOWM5YTItMDFiOS00ZjBmLTllY2YtODEzMzg1`
	`YlMyZDVhLlExODE0MjE0%0ANzc5NDF8UlBUTAySWERlmJqalNhbmlzRUlyaGlYU053LQpHZlNvUW9V`
	`TFpE%0AekxCOD0%3D%0A`
	`The system will now contact the Cisco Smart Licensing servers`
	`to obtain authorization for Smart Licensing`
		Registers the device instance with the Cisco licensing cloud. This step only needs to be performed once per device instance.
		The license agent registers the product with Cisco and receives back an identity certificate. This certificate is saved and automatically used for all future communications with Cisco. The license agent automatically renews the registration information with Cisco every 30 days.

The device is registered with Cisco.

Note Smart licensing may fail when IPv6 is configured on any interface and the device does not have IPv6 connectivity to the Internet or the Cisco Smart Software Agent at tools.cisco.com, resulting in log file error messages such as those shown below.

(Note that these messages may also appear as a result of other conditions being true.)

```
%SMART_LIC-3-AGENT_REG_FAILED: Smart Agent for Licensing Registration with Cisco licensing
 cloud failed: Fail to send out Call Home HTTP message.
```

```
%SMART_LIC-3-COMM_FAILED: Communications failure with Cisco licensing cloud: Fail to send
out Call Home HTTP message.
```

If connectivity failed due to this issue, see Re-establishing Connectivity to the Cisco Smart Call Home Server when IPv6 is Configured, on page 43.

What to do next

Go to Requesting Cisco Smart License Throughput Level Licenses, on page 44.

Registering the Router with the Cisco Licensing Cloud (CSSM satellite)

Note If you are registering the router and using CSSM satellite, go to the following section instead: Registering the Router with the Cisco Licensing Cloud, on page 40.

After you have enabled Cisco Smart Licensing, you must register the router with Cisco. Using the ID token, the license agent on the router registers the product with Cisco and then receives back an identity certificate. This certificate is used for all future communications with Cisco. The license agent on the router automatically renews the registration information with Cisco every 30 days. This renewal of registration is done once for each product instance. See http://www.software.cisco.com to determine the id-token.

SUMMARY STEPS

1. **profile** CiscoTAC-1
2. **no destination address http** *default-url*
3. **destination address http** *satellite-url*
4. **exit**
5. **crypto pki trustpoint** SLA-TrustPoint
6. **revocation-check none**
7. **exit**
8. **license smart register idtoken** *id-token*

DETAILED STEPS

	Command or Action	Purpose
Step 1	**profile** CiscoTAC-1 **Example:** `Router(cfg-call-home)# profile CiscoTAC-1`	Enables TAC profile configuration mode.
Step 2	**no destination address http** *default-url* **Example:** `Router(cfg-call-home-profile)# no destination address https://tools.cisco.com/its/service/oddce/services/DDCEService`	Removes the previously configured destination address for the Cisco Smart Software Agent.
Step 3	**destination address http** *satellite-url*	*satellite-url*—To determine the URL of the transport gateway, see the CSSM Satellite documentation. The *satellite-url* is similar to this example: `http://<ip-address>/Transportgateway/services/DeviceRequestHandler`
Step 4	**exit**	Exits TAC profile configuration mode.

	Command or Action	Purpose
Step 5	**crypto pki trustpoint** SLA-TrustPoint	Starts ca-trustpoint configuration mode and create a name, SLA-Trustpoint, for the CertificateAuthority server.
Step 6	**revocation-check none**	Certificate checking is ignored. Use this command if you are configuring software using Cisco Smart Software Manager satellite (CSSM satellite). This command ensures that revocation checking of the certificate is disabled when the trust policy is in use.
Step 7	**exit**	Exits ca-trustpoint configuration mode and returns to global configuration mode.

Step 8	**license smart register idtoken** *id-token*
	Example:
	`Router# license smart register idtoken YjBkOWM5YTItMDFiOS00Z`
	`jBmLTllY2YtODEzMzg1YTMyZDVhLTEzODE0MjE0%0ANzc5NDF8U1B`
	`DUIAySWFRImJqalNnbmlzRUIyaGlYU053L0pHZTNvUW9VTFpE%0AekxCOD0%3D%0A`
	The system now contacts the Cisco Smart Licensing servers to obtain authorization for Smart Licensing
		Registers the device instance with the Cisco licensing cloud. This step only needs to be performed once per device instance.
		The license agent registers the product with Cisco and receives back an identity certificate. This certificate is saved and automatically used for all future communications with Cisco. The license agent automatically renews the registration information with Cisco every 30 days.

What to do next

Go to Requesting Cisco Smart License Throughput Level Licenses, on page 44

Re-establishing Connectivity to the Cisco Smart Call Home Server when IPv6 is Configured

This section describes what to do if there is a failure to connect to the Cisco Smart Call Home Server when IPv6 is configured, as mentioned previously in Enabling Cisco Smart Licensing, on page 21.

To re-establish connectivity with the Cisco Smart Call Home Server, use one of the following two methods, depending on the version of Cisco IOS XE that you are using:

If you are using one of the following recent versions of Cisco IOS XE: 3.16.6, Denali 16.3.4 and later, Everest 16.4.2 and later, Everest 16.5.1 and later, see Re-establishing Connectivity, on page 43.

Note that in some cases, after configuring the previous steps, you may need to restart the router to fully re-establish connectivity.

Re-establishing Connectivity

This method applies to the following Cisco IOS XE releases: Cisco IOS XE 3.16.6, Cisco IOS XE Denali 16.3.4 and later, Everest 16.4.2 and later, and Everest 16.5.1 and later.

If there is an IPv6 address on an interface and the device cannot connect to the Internet or Smart software agent, configure the interface to only use IPv4 for smart licensing, with the following configuration mode command:

ip http client source-interface *interface*

Example:

Router(config)# **ip http client source-interface** GigabitEthernet1

Note The interface GigabitEthernet1 needs to have an IPv4 address, not an IPv6 address.

Configures the interface to use IPv4.

Note The call-home profile configuration with the static IP address corresponding to FQDN *tools.cisco.com* is not recommended as a long-term solution, since the IP address might change in future.

Requesting Cisco Smart License Throughput Level Licenses

Request a license corresponding to the configured technology package level and throughput level.

Prerequisites

Register the device with the Smart License server.

Changing Throughput Licenses

When working with Cisco Smart Licenses, using the **platform hardware throughput level** command requests a license for the new throughput level. Typically, the activation process requires several minutes. During this time, the new license remains “pending.”

Before the Cisco IOS XE 3.17 release, when changing throughput, the effective throughput would drop to 100 kbps while the new throughput license was pending. When the new license was activated, throughput would change to the newly configured level.

Beginning in the Cisco IOS XE 3.17 release, and including Cisco IOS XE Denali 16.2 and later, the transition is smoother. The router maintains the original throughput level until the license for the new throughput is activated.

In the following example, the router has been authorized previously for a throughput of 100M. The first line in the example is a request for a 250M throughput license. While the request is pending, the **show license all** command indicates the current authorized level (100M) and the pending license (250M), both shown in bold.

```
ultra-mcp(config)#platform hardware throughput level MB 250
Wait for 250M license request to succeed, continue to use existing 100M license until then
ultra-mcp(config)#end
ultra-mcp#show license all
Smart Licensing Status
======================
Smart Licensing is ENABLED
Registration:
  Status: REGISTERED
  Smart Account: CSR1000v
  Virtual Account: AX_SEC_IPB
  Export-Controlled Functionality: Allowed
```

```
  Initial Registration: SUCCEEDED on Nov 06 11:59:12 2015 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: May 04 11:59:11 2016 UTC
  Registration Expires: Nov 05 11:56:09 2016 UTC
License Authorization:
  Status: AUTHORIZED on Nov 09 13:37:00 2015 UTC
  Last Communication Attempt: SUCCEEDED on Nov 09 13:37:00 2015 UTC
  Next Communication Attempt: Nov 09 13:39:20 2015 UTC
  Communication Deadline: Feb 07 13:33:58 2016 UTC
License Usage
==============
regid.2014-05.com.cisco.ax_100M
,1.0_2fff5ed6-e23c-455d-ade3-83ba3c8ed890 (ax_100M):
  Description:
  Count: 1
  Version: 1.0
  Status: AUTHORIZED
(ax_250M
):
  Description:
  Count: 1
  Version: 1.0
  Status: PENDING

Product Information
===================
UDI: PID:CSR1000v,SN:9R8ORIT8CB0
Agent Version
=============
Smart Agent for Licensing: 1.4.0_rel/28
Component Versions: SA:(1_4_rel)1.1.7, SI:(rel22)1.1.0, CH:(rel5)1.0.1, PK:(rel18)1.0.0
```

SUMMARY STEPS

1. **configure terminal**
2. **license boot level** {**ipbase** | **security** | **ax** | **appx**}
3. **platform hardware throughput level MB** {**10** | **100** | **1000** | **10000** | **250** | **2500** | **50** | **500** | **5000** }

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal**	Enter config mode.
Step 2	**license boot level** {**ipbase** | **security** | **ax** | **appx**}	Specify the technology package level.
Step 3	**platform hardware throughput level MB** {**10** | **100** | **1000** | **10000** | **250** | **2500** | **50** | **500** | **5000** }	Configure the throughput level for the license to request.

Requesting Memory Add-on License

For information about memory add-on licenses, see Understanding the Cisco CSR 1000v Memory Allocation, on page 8. For Cisco Smart Licensing, the procedure for requesting the license is as follows:

SUMMARY STEPS

1. **configure terminal**

2. **platform memory add** *memory*
3. **show platform software vmemory info**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal**	Enter config mode.
Step 2	**platform memory add** *memory*	
Step 3	**show platform software vmemory info**	Verifies the updated memory allocation.

Requesting Smart License Broadband license

For information about broadband licenses, see Information About Installing Broadband Feature License, on page 13 and Installing Broadband Feature License, on page 13. For Cisco Smart Licensing, the procedure for requesting the license is as follows:

SUMMARY STEPS

1. **configure terminal**
2. **platform broadband** {**1K** | **2K** | **3K** | **4K**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure terminal**	Enter config mode.
Step 2	**platform broadband** {**1K** | **2K** | **3K** | **4K**} **Example:** `Router(config)# platform broadband 1K`	Adds support for the number of broadband sessions to accommodate the added broadband feature license(s). You can add 1000 sessions for each broadband feature license you are planning to install. For example, if you plan to add two broadband feature licenses, enter the value as 2K.

Manually Renewing the ID Certificate

By default, the ID certificate is automatically renewed every 6 months. You can manually renew the ID certificate using this procedure.

This may be useful in either of the following circumstances:

- If you have a limited window of Internet access
- After making licensing changes in the Smart Software Manager

SUMMARY STEPS

1. **license smart renew id**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart renew id** **Example:** `Router# license smart renew id`	Renews the ID certificate.

Manually Renewing the License

By default, the license (also called "entitlement") is automatically renewed every 30 days. You can manually renew the license using this procedure.

This may be useful in either of the following circumstances:

- Only a limited window of Internet access is available.
- After making licensing changes in the Smart Software Manager.

Note The terms "license" and "entitlement" are equivalent and are used interchangeably.

SUMMARY STEPS

1. **license smart renew auth**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart renew auth** **Example:** `Router# license smart renew auth`	Renews the license (also called "entitlement").

Unregistering a Device from Cisco Smart Licensing

SUMMARY STEPS

1. **license smart deregister**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**license smart deregister**	Removes the Cisco Smart Licensing registration for the device instance. All Cisco Smart Licensing certificates are removed on the router and the entitlements are released from the Smart Call Home backend server.

Disabling Cisco Smart Licensing

Describes how you can disable Cisco Smart Licensing and switch back to standard Cisco Software Licensing (CSL) mode.

SUMMARY STEPS

1. **no license smart enable**
2. **reload**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**no license smart enable**	Disables Cisco Smart Licensing on the device instance and switches to Cisco Software Licensing (CSL) mode. Reboot the device for the change to take effect. **Note**: When you disable Smart Licensing, the Cisco Software License (CSL) and all licensing calls pass through the Smart Agent. For the **no** case, if Smart Licensing is already registered, the Smart Agent performs the **license smart deregister** operation that deactivates Smart Licensing.
Step 2	**reload**	Restarts the router. This is required to complete the process of disabling the Cisco Smart License.

License Out-of-Compliance Behavior

A successfully licensed router may receive an "out of compliance" syslog message during reload or renewal/reauthorization of license from the Smart Licensing server if an attempt is made to contact the Smart Licensing server for a license and the number of available licenses recorded on the Smart Licensing account is exceeded. This message may also occur as a result of the router having been configured to have a higher performance level compared to the previously purchased feature set.

After the "out of compliance" message appears, the system continues to operate at the previously licensed throughput rate.

License Behavior with no Connectivity to the Smart Licensing Server

When a successfully licensed Cisco CSR 1000v/Cisco ISRv is unable to contact the Smart Licensing server, during reload or reauthorization or renewal of license, then the router continues to operate at the previously licensed state.

The license authorization expires if the CSSM satellite server has had no connectivity with the Smart Licensing server for more than 90 days. The license then changes to a **License Authorization Expired State** and the router continues to operate at the previously licensed state and runs in the Feature Restricted mode.

The following example shows a typical license expiry message that appears on the console.

```
*Aug 4 08:02:19.056: %VXE_THROUGHPUT-6-CLI_RESTRICTED_LICENSE_EXPIRE: System is in
feature restricted mode due to license expire. Configuration CLIs have been blocked.
nvram:startup-config is write protected (read-only). Valid license and reboot is required
to recover
from this state. Use configuration CLI - platform hardware throughput
restricted-throughput-rate-mode
if startup-config changes are needed.
```

In the Feature Restricted mode, the feature configuration commands are blocked except for those commands that are needed for licensing. Also, the commands for setting the technology features and the throughput rate are available.

Note In the Feature Restricted mode you cannot save or write the running configuration. However, starting from the 17.1.1 release, you can execute the copy command except while copying to statup config/NVRAM, as startup configuration is write protected.

From the 17.1.1 release, when your device is in the Feature Restricted mode, if the hostname was previously Router#, it changes to (restricted)Router#. Renew your license to move out of the Feature Restricted mode.

Example 1

This example shows that if you enter a write command an error message appears.

router# **write**

```
nvram config write protected
```

Example 2.

This example shows that if you enter a reload command an error message appears.

router# **reload**

```
System configuration has been modified. Save? [yes/no]: yes

nvram config write protected

Proceed with reload? [confirm]
```

After you confirm by pressing Enter and proceed with the reload, the existing configuration is retained and the router continues to run. Note that the existing configuration cannot be modified.

If you further attempt to authorize or renew licenses with the Smart Licensing server, and if communication cannot be achieved with the Smart Licensing server (e.g, after rebooting the router), the syslog messages about being in the Feature Restricted mode, are generated. The following example displays this scenario:

```
*Aug 4 08:02:19.056: %VXE_THROUGHPUT-6-CLI_RESTRICTED_LICENSE_EXPIRE:

System is in feature restricted mode due to communication fault to license server.
Configuration CLIs have been blocked. nvram:startup-config is write protected (read-only).
Valid license and reboot is required to recover from this state.
Use configuration CLI - platform hardware throughput restricted-throughput-rate-mode
if startup-config changes are needed.
```

In the Feature Restricted mode, the **platform hardware throughput restricted-throughput-rate-mode** command is enabled. This command is only visible in the Feature Restricted mode. After issuing this command, the throughput rate becomes 100 Kbps after the next reload. See the following example:

```
router(config)# platform hardware throughput restricted-throughput-rate-mode
```

After you enter the **platform hardware throughput restricted-throughput-rate-mode** command, the system displays the following message:

```
% The config will take effect on next reboot. This device will need to be re-licensed
```

After the next reload, the throughput rate restricted mode is in operation, and the traffic throughput rate is 100 Kbps.

When the modification of the start-up configuration is disabled, changes you make (such as registering a new license or configuring the license server connectivity) in the Feature Restricted mode are lost if you reboot the router. The router then returns to the Feature Restricted mode. If you use the **platform hardware throughput restricted-throughput-rate-mode** command, recovery is possible as you can use the configuration commands that are required to restore the router license.

If the configuration commands to renew licensing are not required, you can reboot the Cisco CSR 1000v / Cisco ISRv instance. The device communicates with the Smart Licensing server and then pre-existing licenses are renewed.

Activating Permanent License Reservation

Introduction to Activating Permanent License Reservation

Activating a license using Permanent License Reservation (PLR) allows a device to use a license without having to be connected to Cisco Smart Software Manager (CSSM) or CSSM satellite. This feature is available using release Cisco IOS XE Everest 16.5.1a or later.

Activating Permanent License Reservation

This process describes how to activate permanent license reservation (PLR), which allows a product instance or device to have universal entitlement to a license. After activating PLR, the device does not need to communicate with Cisco Smart Software Manager(SSM) or a Cisco SSM server to maintain its ability to use features associated with a license. The license will not become out of compliance.

Procedure

	Command or Action	Purpose
Step 1	**configure terminal**	Enter global configuration mode on the device onto which you want to install a license using PLR.
Step 2	**license smart enable**	Enable smart licensing.
Step 3	**license smart reservation**	Enables reservation mode.
Step 4	**end**	

Step 5	**license smart reservation request universal**	Request a reservation request code, which you will later enter in Cisco SSM. For example:
		`license smart reservation request universal`
		`Enter this request code in the Cisco Smart Software Manager portal:`
		`BC-ZCSR1000V:959Z2A5VVWQ-AB5nwN3rt-09`
		Make a note of the request code.

Step 6	Log into Cisco Smart Software Manager (SSM) and navigate to the virtual account that contains the licenses that you need.	**Note** In the list of licenses listed in the virtual account, ensure that there is a permanent license reservation (PLR) license available. (Click the license name and see if the license expiration is "Perpetual".)
Step 7	In Cisco SSM, in the **Licenses** tab, click **License Reservation** and enter the request code obtained in Step 5. The authorization code is displayed on the screen (short ASCII character string).	
Step 8	Make a note of the authorization code.	The authorization code is securely tied to the Universal Device Identifier (UDI) of the device.
Step 9	Enter global config (EXEC) mode on the device where you want to activate PLR.	
Step 10	**license smart reservation install** *auth-code*	(*auth-code* is the authorization code obtained in Step 7.) PLR is now active. This reservation is permanent until it is manually returned or deactivated after it is no longer required.
Step 11	**platform hardware throughput level MB** *throughput*	Set the throughput level (MB) (Range 10 to 10000).

What to do next

Later, to return or deactivate PLR, see Deactivating Permanent License Reservation, on page 51.

Deactivating Permanent License Reservation

Follow these steps to deactivate (return) Permanent License Reservation (PLR). For example, if you want to change the licensing on the device and save the cost of using PLR.

Step 1 Enter EXEC mode.

Step 2 **license smart reservation return** {*auth-code*}

- **license smart reservation return**
- **license smart reservation return auth-code**

Note In rare cases, you can use this second form of the command, when you input a value for the *auth-code*. This is useful when the current reservation status of the license was previously cleared; for example, after the **license smart reservation cancel** command was used to cancel a request.

This command generates a reservation return code.

Example:

```
license smart reservation return
Reservation return code: BAAeUF-rz6EiG-PXLMQB-CRBnrx-TsaEep-A3x
```

Step 3 Make a note of the return code.

Step 4 In CSSM, log in and navigate to the **Product Instances** tab for the virtual account in which the product is registered. Locate the entry that matches the Unique Device Identifier (UDI) of the device that you want to remove from the list.

Step 5 Select **Actions**, click **Remove Product Instance**.

Cisco SSM removes the product instance.

Step 6 Paste the return code and click **Remove**.

The device is unregistered and operates with a default throughput of 1 Mbps.

Enabling Utility Reporting

Utility Reporting—Overview

Utility Reporting allows you to pay for features based on usage, instead of paying in advance for feature licenses. Utility Reporting is available for the Cisco CSR 1000v or Cisco ISRv using Cisco IOS XE Fuji 16.8.1 or higher.

Utility Reporting collects usage data from products that have Cisco Smart Licensing and Utility Reporting enabled and sends the usage data via the CSSM satellite to the Cisco Service Billing Platform (SBP), which produces daily reports. Usage data is produced in the Resource Utilization Measurement (RUM) format (ISO/IEC 19770-4).

The device collects usage data every 15 minutes and sends it to the CSSM satellite every four hours. Every 8 hours the CSSM satellite sends data to the Cisco SBP. The device stores usage data for up to 30 days and the CSSM satellite saves data for 90 days. This data backup allows recovery after, for example, the CSSM satellite becomes disconnected from the Cisco SBP. If there is a lack of connection for more than 30 days, the Cisco accounts team should contact you to communicate any issues.

Utility Reporting—Prerequisites

Before enabling Utility Reporting, perform the following steps:

- Add the licensese that are going to be used for utility reporting (using a post-payment method) into a smart account. For example, see Smart Software Licensing Overview.
- Enable Smart Licensing on the device.

  Summary steps:

  ```
  configure terminal
  license smart enable
  exit
  ```

  See Enabling Cisco Smart Licensing, in this document.
- Install and configure CSSM satellite. For further information, see Smart Software Manager satellite.
- Register the device. For further information, see Registering the Router with the Cisco Licensing Cloud (CSSM satellite), on page 42, in this document.

How to Enable Utility Reporting

Step 1 **configure terminal**

Enters the global configuration mode.

Step 2 **license smart utility**

Registers your intention to use the Utility Reporting feature on the device.

Use the "no" form of this command, `no license smart utility`, to signal your intention to remove the Utility Reporting feature.

Example:

```
Device(config)# license smart utility
```

Step 3 **license smart transport smart**

Sets the transport type as `smart` (4th keyword above). This is required for utility reporting communication between the smart agent and the CSSM or the CSSM satellite.

Example:

```
Device(config)# license smart transport smart
```

Step 4 **license smart url** *registration-url*

Sets the URL to be used by the smart transport between the smart agent and the CSSM or the CSSM satellite. Here,

registration-url - is the transport gateway URL. For more information, see CSSM Satellite. *registration-url* has the following form: `https://<OnPrem-FQDN>/SmartTransport`

Use the "no" form of this command, `no license smart url`, to clear the value of the *registration-url*.

Example:

```
Device(config)# license smart url https://cssm-onprem.dcloud.cisco.com/SmartTransport
```

Verifying Utility Reporting

To verify that utility reporting data is being sent from the CSSM satellite to Cisco, enter the command shown in the following example, in configuration mode:

show license all

In the sample output shown below, in the "`Utility`" section, the line "`Last attempt: SUCCEEDED on Dec 19 18:23:02 2017 UTC`" shows when the utility report data was last sent successfully. Other data shows the date and time that the report was sent, and the expected date and time of the next utility report (4 hours later).

```
Smart Licensing Status
======================

Smart Licensing is ENABLED

Registration:
  Status: REGISTERED
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Dec 13 16:11:51 2017 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Feb 19 16:24:44 2018 UTC
  Registration Expires: Jul 05 16:50:33 2018 UTC

License Authorization:
  Status: AUTHORIZED on Dec 13 18:23:51 2017 UTC
  Last Communication Attempt: NOT STARTED
    Failure reason: Device in Thirdparty Utility Mode
  Next Communication Attempt: None
  Communication Deadline: Mar 19 18:23:02 2018 UTC

Utility:
  Status: ENABLED
  Utility report:
    Last success: Dec 19 18:23:03 2017 UTC
    Last attempt: SUCCEEDED on Dec 19 18:23:02 2017 UTC
    Next attempt: Dec 19 22:23:02 2017 UTC

  Customer Information:
    Id: <empty>
    Name: <empty>
    Street: <empty>
    City: <empty>
    State: <empty>
    Country: <empty>
    Postal Code: <empty>

Data Privacy:
  Sending Hostname: yes
    Callhome hostname privacy: DISABLED
    Smart Licensing hostname privacy: DISABLED
  Version privacy: DISABLED

Transport:
  Type: Smart
  Registration URL: https://cssm-onprem.dcloud.cisco.com/SmartTransport
  Utility URL: http://10.87.9.106/Transportgateway/services/DeviceRequestHandler
```

```
License Usage
==============

(ax_1G):
  Description:
  Count: 1
  Version: 1.0
  Status: AUTHORIZED
  Utility Subscription id:  81

Product Information
===================
UDI: PID:CSR1000V,SN:9ZT6BKI8CXG

Agent Version
=============
Smart Agent for Licensing: 4.3.0_rel/8
Component Versions: SA:(1_3_dev)1.0.15, SI:(dev22)1.2.1, CH:(rel5)1.0.3, PK:(dev18)1.0.3
```

To set the information that will appear in the "`Customer Information`" section of the **show license** command above, use the following command:

license smart utility customer_info *info_type info_value*, where info_type is one of the following: city, country, id, name, postalcode, state, street.

Example

```
license smart utility customer_info city New York
```

Troubleshooting Cisco Smart License Issues

Determining Device Registration Information

Use the **show license all**command to display the device registration information.

```
Router#show license all
Smart Licensing Status
======================
Smart Licensing is ENABLED
Registration:
  Status: REGISTERED
  Smart Account: BU Production Test
  Virtual Account: CRDC_SH_3
  Export-Controlled Functionality: Allowed
  Initial Registration: SUCCEEDED on Jul 08 20:45:54 2015 UTC
  Last Renewal Attempt: None
  Next Renewal Attempt: Jan 04 20:45:54 2016 UTC
  Registration Expires: Jul 07 05:59:29 2016 UTC
License Authorization:
  Status: AUTHORIZED on Jul 08 20:46:05 2015 UTC
  Last Communication Attempt: SUCCEEDED on Jul 08 20:46:05 2015 UTC
  Next Communication Attempt: Aug 07 20:46:05 2015 UTC
  Communication Deadline: Oct 06 05:59:43 2015 UTC
License Usage
==============
CSR 1KV AX 500M (ax_500M):
  Description: CSR 1KV AX 500M
  Count: 1
  Version: 1.0
```

```
  Status: AUTHORIZED
Product Information
===================
UDI: PID:CSR1000v,SN:9Q0BWG3BHL0
Agent Version
=============
Smart Agent for Licensing: 1.4.0_rel/11
Component Versions: SA:(1_4_rel)1.0.10, SI:(rel21)1.2.0, CH:(rel4)1.0.23, PK:(rel17)1.0.5
```

Additional Commands for Troubleshooting

The **show call-home profile all** and **show license tech support** commands may be helpful during troubleshooting.

Understanding the License-Based Restriction on Aggregate Bandwidth

The router includes a license shaper that may restrict the aggregate bandwidth of the router's interfaces. For example, if a 50 Mbps license is installed, then a maximum of 50 Mbps of bidirectional traffic is possible.

The license shaper regulates the throughput on interfaces for both priority traffic and non-priority traffic:

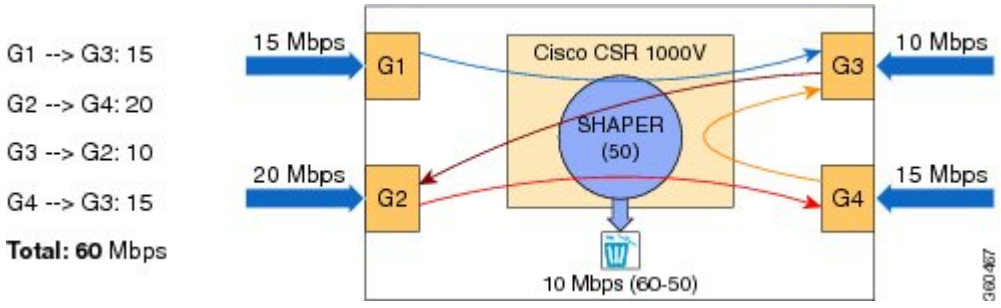
- (Cisco IOS XE 3.10S and earlier) The license shaper regulates the throughput on non-management interfaces only. The GigabitEthernet 0 dedicated management interface is not counted

  .
- (Cisco IOS XE 3.11S and later, and IOS XE Denali 16.2 and later) The license shaper regulates the throughput on all interfaces.

Throughput limits are checked globally, not on a per-interface basis. The license shaper does not distinguish between different types of traffic, such as for IPSec or NAT. If the throughput level is exceeded, then packets may get discarded.

The figure below shows how the license shaper, also known as a traffic shaper, works. In this example, the four interfaces on a Cisco CSR 1000v are passing an aggregated traffic level of 60 Mbps. Because this exceeds the 50 Mbps license-enforced maximum throughput, 10 Mbps of traffic is discarded.

Figure 1: Throughput Example



To check the license-based performance limiter value, use the following command for your interface:

```
Router# show platform hardware qfp active feature qos queue out int GigabitEthernet1 hier
```

```
det | inc max:
     orig_max  : 0   ,  max: 33333          child policy-map
     orig_max  : 0   ,  max: 500000         parent policy-map
     orig_max  : 0   ,  max: 1050000000     interface rate limiter
     orig_max  : 0   ,  max: 2500000        license performance limiter
     orig_max  : 0   ,  max: 10000000000    entry for ROOT/SIP infra (ignore rate)
```

The value for the license performance limiter field should match the current maximum throughput level as shown with the **show platform hardware throughput level** command.

Note The license shaper includes an extra scheduler node in the default HQF hierarchy. The router does not provide an option to detect congestion for a particular node in the HQF hierarchy.

For more information about verifying the VM performance indicators, see your hypervisor documentation.

To verify the actual throughput, use the following command:

```
Router# show platform hardware qfp active datapath utilization summary
      CPP 0:                 5 secs    1 min     5 min     60 min
      Input:   Total (pps)    59232     59234     59237     59234
                     (bps)    58757104  58757824  58760840  58757880
      Output:  Total (pps)    48839     48835     48833     48833
                     (bps)    50011264  50012072  50009312  498768736
      Processing: Load (pct)  33        34        34        34
```

In the example, the input rate shown in bold is close to 60 Mbps. The output rate shown in bold is close to 50 Mbps. In this case, the input rate exceeds 50 Mbps, the maximum license rate allowed.

The following command displays the number of packages dropped when the maximum throughput is exceeded:

```
Router# show platform hardware qfp active statistics drop clear | exc _0_
-------------------------------------------------------------------------
Global Drop Stats                 Packets           Octets
-------------------------------------------------------------------------
TailDrop                          2018258           256333010
```

When the actual throughput level approaches the maximum allowed by the installed license, you will receive an alert message similar to the following (the message may differ depending on the release version):

```
Dec 13 22:00:29.699: %BW_LICENSE-3-THROUGHPUT_THRESHOLD_LEVEL: F0: cpp_ha:
Average throughput rate exceeded 95 percent of licensed bandwidth 3 times, sample period
300 seconds, in last 24 hours
```

When the throughput exceeds the maximum allowed bandwidth set by the license, you will receive an alert message similar to the following (Cisco IOS XE 3.12S and later):

```
*Dec 13 22:00:29.699: %BW_LICENSE-4-THROUGHPUT_MAX_LEVEL: F0: cpp_ha:
Average throughput rate exceeded the total licensed bandwidth 50000000 bps and dropped 7
times, sample period 300 seconds, in last 24 hours
```

You can configure the QoS policies at the interface level to guarantee that high-priority traffic is not dropped. For more information, see the QoS configuration guides: https://www.cisco.com/c/en/us/support/routers/cloud-services-router-1000v-series/products-installation-and-configuration-guides-list.html.

Managing Throughput Notifications

You can configure the Cisco CSR 1000v/ ISRv to notify you when a certain percentage of the maximum throughput level is reached. The maximum allowable throughput is based on the installed throughput license.

Note This feature is available on Cisco IOS XE 3.13S or later, and Cisco IOS XE Denali 16.3.1 and later.

By default, when the router first boots, the throughput level notification is enabled, and notifications are sent when the router reaches 95 percent of the maximum throughput level. The throughput level is measured every 300 seconds. When the router is rebooted, the threshold and interval level settings configured using the set platform hardware throughput-monitor command are retained.

The following command configures the hardware throughput monitor settings. The **threshold** *percentage* value represents the percentage of the maximum throughput at which the system notifies you. The valid range is from 75 to 95, and the default value is 95 percent.

The **interval** value represents how often the system measures the throughput level. The valid range is from 30 to 86400 seconds. The default value is 300 seconds.

set platform hardware throughput-monitor threshold *percentage* **interval** *seconds*

Example

```
Router# set platform hardware throughput-monitor threshold 85 interval 30
```

To display the platform hardware throughput monitor settings, use the **show platform hardware throughput-monitor parameters** command, as shown in the following example:

```
Router# show platform hardware throughput-monitor parameters

  Throughput monitor parameters
  Throughput monitor threshold: 95 percent
  Throughput monitor interval: 300 seconds
  Throughput monitor status: enabled
```

The following example shows a console log message received when the average throughput has exceeded 95 percent of the maximum throughput with a sample period of 300 seconds:

```
Dec 13 22:00:29.699: %BW_LICENSE-3-THROUGHPUT_THRESHOLD_LEVEL: F0: cpp_ha: Average
throughput rate exceeded 95 percent of licensed bandwidth 3 times, sample
 period 300 seconds, in last 24 hours
```

The following example shows a console log message received when the average throughput approaches maximum allowed throughput set by the installed license:

```
Dec 13 22:00:29.699: %BW_LICENSE-4-THROUGHPUT_MAX_LEVEL: F0: cpp_ha: Average
throughput rate exceeded the total licensed bandwidth 50000000 bps and dropped
packets 7 times, sample period 300 seconds, in last 24 Hours
```

To disable the platform hardware throughput monitor, perform the following command:

set platform hardware throughput-monitor disable

Requesting a New Virtual UDI

The router's license is node-locked to the vUDI. If you clone the router's VM to a new VM instance, the vUDI is in most cases automatically updated when the router first boots up on the cloned machine. However, if the vUDI is not automatically updated, you must manually request a new vUDI on the cloned VM instance.

Caution Requesting a new vUDI will invalidate the existing license. If you later need to rehost the license due to a system failure, you may need to perform additional steps on the Cisco Software Licensing portal. For more information on rehosting the router license, see Voluntarily Rehosting the License to a New VM and Obtaining a Rehost License if the System Fails.

Perform the following step in EXEC mode:

SUMMARY STEPS

1. **request license new-udi**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**request license new-udi** **Example:** `Router# request license new-udi`	Requests that a new virtual UDI be assigned to the router's VM instance.

What to do next

Once you enter the **request license new-udi** command, you will be prompted to confirm, and then you will receive a series of system messages confirming the request:

```
Executing this command will invalidate the existing license,
proceed with generating new-udi?[confirm]
New udi CSR1000v:9MF19951DMU
Router#
*Aug 21 11:24:27.275:  found an eval license info: csr1kv_medium
*Aug 21 11:24:27.276:  Step 3. deletion of NOT-in-use licenses
*Aug 21 11:24:27.276:  Step 4. deletion of in-use licenses
*Aug 21 11:24:27.440: %LICENSE-2-UDI_CHANGED: UDI of this instance changed from OLD:
CSR1000V:9YA3086B993 to
New: CSR1000V:9MF19951DMU
```

To display the UDI history of the router's feature license, including previous virtual UDIs, enter the **show license udi history** command. The following example displays the UDI history of the feature license of a Cisco CSR 1000v:

```
Router# show license udi history
SlotID   PID                    SN                      UDI
--------------------------------------------------------------------------------
*        CSR1000V              9MF19951DMU     CSR1000V:9MF19951DMU
 Invalidated UDIs:
```

```
-------------------------------------------------------------
1. CSR1000V : 9YA3086B993
```

Cisco Software Licensing (IOS XE 3.12 or Earlier)

Activating CSL Evaluation Licenses for Cisco IOS XE 3.12S and Earlier

Note Licenses provided in Cisco IOS XE 3.12S and earlier (Standard, Advanced, and Premium) are no longer available. This material is provided as legacy information.

When the Cisco CSR 1000v first boots, the network interfaces are activated but feature support is limited and the throughput is limited to 2.5 Mbps. The evaluation license is bundled with the software, but you must activate the evaluation license to access the features.

The evaluation license expires 60 days from the time it is activated.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **license boot level {standard | advanced** | **premium**}
4. **end**
5. **write memory**
6. **reload**
7. show license detail
8. show platform hardware throughput level

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**license boot level {standard | advanced** | **premium**} **Example:** **Example:**	Activates the evaluation license on the Cisco CSR 1000v upon the next reload. You must accept the End User License Agreement (EULA) to use the evaluation license.

	Command or Action	Purpose
	Example: **Example:** `Router(config)# license boot level advanced`	**Note** In Cisco IOS XE 3.12.1S and later 3.12.xS releases, use the **standard** option for the IPBase feature set, the **advanced** option for the Security feature set, and the **premium** option for the AX feature set.
Step 4	**end** **Example:** `Router(config)# end`	Exits global configuration mode.
Step 5	**write memory** **Example:** `Router# write memory`	Saves the running configuration to NVRAM.
Step 6	**reload** **Example:** `Router# reload`	Restarts the Cisco CSR 1000v to boot to the feature level set using the **license boot level** command.
Step 7	show license detail **Example:** `Router# show license detail`	After the Cisco CSR 1000v restarts, verifies that the license has been installed and is active.

Step 8	show platform hardware throughput level
	Example:
	
	`Router# show platform hardware throughput level`
	Example:
	
	`The current throughput level is 2500 kb/s`
		Verifies the Cisco CSR 1000v maximum throughput level.

What to do next

The evaluation license expires 60 days from the time it is activated.

Installing CSL Regular Licenses for Cisco IOS XE 3.12S and Earlier

Note Licenses provided in Cisco IOS XE 3.12S and earlier (Standard, Advanced, and Premium) are no longer available. This material is provided as legacy information.

In Cisco IOS XE 3.12S and earlier, the Cisco CSR 1000v first boots in limited mode with the Standard feature set enabled and the maximum throughput limited to 2.5 Mbps.

You can generate multiple licenses for the Cisco CSR 1000v from one PAK. The purchased PAK determines the number of licenses you can generate.

Repeat these steps for each license available for your PAK.

SUMMARY STEPS

1. Obtain the PAK.
2. **enable**
3. **show license udi**
4. Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal: "http:/www.cisco.com/go/license"
5. license install *stored-location-url*
6. **configure terminal**
7. **license boot level {standard | advanced** | **premium**}
8. **end**
9. **write memory**
10. **reload**
11. show license detail
12. **end**
13. **configure terminal**
14. **platform hardware throughput level MB**{**10 | 100 | 1000 | 250 | 2500 | 50 | 500 | 5000**}
15. **end**
16. show platform hardware throughput level

DETAILED STEPS

	Command or Action	Purpose
Step 1	Obtain the PAK.	The PAK is provided to you when you order or purchase the right to use a feature set. • The PAK serves as a receipt and is used as part of the process to obtain a license.
Step 2	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 3	**show license udi** **Example:** `Router# show license udi`	Displays all the UDI values that can be licensed in a system. • You need the UDI of the device as part of the process to obtain a license.
Step 4	Convert the PAK to a license by entering the PAK and the UDI into the Cisco Product License registration portal: "http:/www.cisco.com/go/license"	After entering the appropriate information, you will receive an e-mail containing the license information that you can use to install the license:

	Command or Action	Purpose
	Example: `When entering the UDI, enter only the 11-character serial number, for example, 966975BITWG. The UDI is case-sensitive, and should be entered in all capital letters.`	• Copy the license file received from the Cisco Product License Registration portal to the appropriate file system on the device.
Step 5	license install *stored-location-url* **Example:** `Router# license install bootflash:90NVHJ3C26E_20140724194119019.lic`	Installs the license. • Accept the end-user license agreement if prompted.
Step 6	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 7	**license boot level {standard | advanced | premium}** **Example:** `Router(config)# license boot level advanced`	Activates the license on the Cisco CSR 1000v upon the next reload. **Note** In Cisco IOS XE 3.12.1S and later 3.12.xS releases, use the **standard** option for the IPBase feature set, the **advanced** option for the Security feature set, and the **premium** option for the AX feature set.
Step 8	**end** **Example:** `Router(config)# end`	Exits global configuration mode.
Step 9	**write memory** **Example:** `Router# write memory`	Saves the running configuration to NVRAM.
Step 10	**reload** **Example:** `Router# reload`	Restarts the Cisco CSR 1000v to enable the feature set and the maximum throughput supported by the license.
Step 11	show license detail **Example:** `Router# show license detail`	After the Cisco CSR 1000v restarts, verifies that the license has been installed and is active.
Step 12	**end** **Example:**	Exits global configuration mode.

	Command or Action	Purpose
	`Router(config)# end`	
Step 13	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 14	**platform hardware throughput level MB{10 | 100 | 1000 | 250 | 2500 | 50 | 500 | 5000}** **Example:** `Router(config)# platform hardware throughput level 500`	(Optional) Changes the maximum throughput level for the Cisco CSR 1000v. The **available throughput options vary depending on the release version.** **Note** Rebooting the Cisco CSR 1000v is not required.
Step 15	**end** **Example:** `Router(config)# end`	Exits global configuration mode.

Step 16	show platform hardware throughput level
	Example:
	`Router# show platform hardware throughput level`
	Example:
	`The current throughput level is 50000 kb/s`
		Verifies that the Cisco CSR 1000v maximum throughput level matches that of the installed license.

What to do next

Repeat these steps for each license available for your PAK.

The following is an example of the **show license detail** command showing an installed active license:

```
Router# show license detail
Index: 1        Feature: prem_100M                        Version: 1.0
        License Type: Permanent
        License State: Active, In Use
        License Count: Non-Counted
        License Priority: Medium
        Store Index: 0
        Store Name: Primary License Storage
```

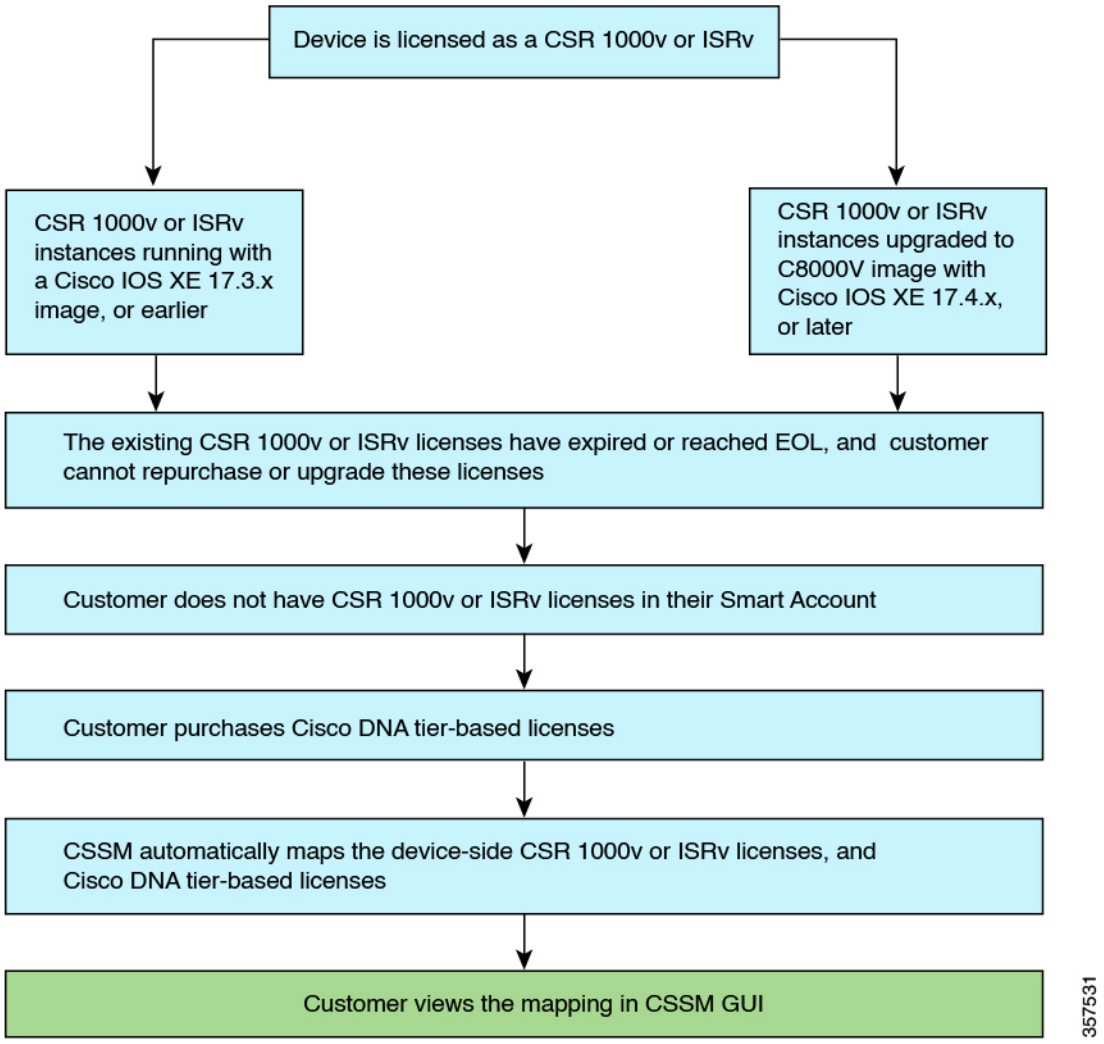
Automatic Mapping of Cisco CSR 1000v and Cisco ISRv Licenses to Cisco DNA Licenses

The Cisco Smart Software Manager (CSSM) manages the licenses for all Cisco devices, including Cisco CSR 1000v and Cisco ISRv. When these licenses reach end-of-life (EOL) in 2022, you must move to the Cisco DNA licenses to continue to use these devices, and to keep your Smart Account compliant. After you activate your Cisco DNA license, the CSSM automatically maps the device licenses (CSR 1000v and Cisco ISRv APPX, AX, SEC and IP Base licenses) to your Cisco DNA license, based on the existing license package and throughput.

Prerequisites for Automatic Mapping of Cisco CSR 1000v and Cisco ISRv Licenses to Cisco DNA Licenses

The CSSM maps the device licenses and Cisco DNA licenses when the following set of conditions are met:

Figure 2: Prerequisites for Automatic Mapping of Cisco CSR 1000v and Cisco ISRv Licenses to Cisco DNA Licenses



Note From Cisco IOS XE 17.4, all platforms support only Smart Licensing using Policy. For Cisco CSR 1000v and Cisco ISRv platforms on Cisco IOS XE 17.3.x or earlier, you must upgrade to Cisco IOS XE 17.4 to move from Smart Licensing to Smart Licensing using Policy.

For details on Cisco CSR 1000v and Cisco ISRv upgrade to Cisco C8000V, see the Cisco Catalyst 8000V Edge Software Installation and Configuration Guide.

For details on Smart Licensing Using Policy, see Smart Licensing Using Policy for Cisco Enterprise Routing Platforms.

Information About Automatic Mapping of Cisco CSR 1000v and Cisco ISRv Licenses to Cisco DNA Licenses

The CSSM maps Cisco CSR 1000v and Cisco ISRv device-side licenses to Cisco DNA licenses based on package type and throughput level.

The IP Base and Security licenses are mapped to the Network Essentials package, and the APPX and AX licenses are mapped to the Network Advantage package.

License throughputs from 10 Mbps to 10 Gbps are mapped to tiers 0 to 3.

Table 2: License Mapping Based on Package

CSR 1000v or Cisco ISRv License Package	Cisco DNA License Package
IP Base, Security	Network Essentials
APPX, AX	Network Advantage

Table 3: License Mapping Based on Throughput

Throughput	Tier
10 Mbps	Tier 0 (T0)
50 Mbps, 100 Mbps	Tier 1 (T1)
250 Mbps, 500 Mbps, 1 Gbps	Tier 2 (T2)
2.5 Gbps, 5 Gbps, 10 Gbps	Tier 3 (T3)

Examples: Automatic Mapping of Cisco CSR 1000v and Cisco ISRv Licenses to Cisco DNA Licenses

Example 1: Cisco CSR 1000v AX 10 Mbps License Mapped to Cisco DNA Network Advantage Tier 0 License

In this example, the customer's device device has a Cisco CSR 1000v AX and 10 Mbps throughput license. When the customer purchases a Cisco DNA license, the CSSM maps this as a Network Advantage Tier 0 license.

Package type: AX = Network Advantage

Throughput: 10 Mbps = Tier 0

You can view the license mapping in CSSM GUI.

Figure 3: CSSM View - CSR 1000v AX 10 Mbps License Mapped to Network Advantage Tier 0

Figure 4: CSSM View - CSR 1000v AX 10 Mbps License Mapped to Network Advantage Tier 0

Example 2: Cisco ISRv SEC 1 Gbps License Mapped to Cisco DNA Network Essentials Tier 2 License

In this example, the customer's device has a Cisco ISRv SEC and 1 Gbps throughput license. When the customer purchases a Cisco DNA license, the CSSM maps this as a Network Essentials Tier 2 license.

Package type: SEC = Network Essentials

Throughput: 1 Gbps = Tier 2

You can view the license mapping in CSSM GUI.

Figure 5: CSSM View - ISRv SEC 1 Gbps License Mapped to Network Essentials Tier 2

Figure 6: CSSM View - ISRv SEC 1 Gbps License Mapped to Network Essentials Tier 2

Device and Network Stack Licenses

The following tables provide information about the corresponding network stack license for every device license and throughput combination.

Table 4: Cisco CSR 1000v Network Stack Licenses

Device License	Throughput	Tier	Network Stack License
CSR-10M-IPB CSR-10M-SEC	10 Mbps	T0	NWSTACK-T0-E
CSR-50M-IPB CSR-100M-IPB CSR-50M-SEC CSR-100M-SEC	50 Mbps 100 Mbps	T1	NWSTACK-T1-E
CSR-250M-IPB CSR-500M-IPB CSR-1G-IPB CSR-250M-SEC CSR-500M-SEC CSR-1G-SEC	250 Mbps 500 Mbps 1 Gbps	T2	NWSTACK-T2-E
CSR-2.5G-IPB CSR-5G-IPB CSR-10G-IPB CSR-2.5G-SEC CSR-5G-SEC CSR-10G-SEC	2.5 Gbps 5 Gbps 10 Gbps	T3	NWSTACK-T3-E
CSR-10M-APPX CSR-10M-AX	10 Mbps	T0	NWSTACK-T0-A
CSR-50M-APPX CSR-100M-APPX CSR-50M-AX CSR-100M-AX	50 Mbps 100 Mbps	T1	NWSTACK-T1-A

Device License	Throughput	Tier	Network Stack License
CSR-250M-APPX CSR-500M-APPX CSR-1G-APPX CSR-250M-AX CSR-500M-AX CSR-1G-AX	250 Mbps 500 Mbps 1 Gbps	T2	NWSTACK-T2-A
CSR-2.5G-APPX CSR-5G-APPX CSR-10G-APPX CSR-2.5G-AX CSR-5G-AX CSR-10G-AX	2.5 Gbps 5 Gbps 10 Gbps	T3	NWSTACK-T3-A

Table 5: Cisco ISRv Network Stack Licenses

Device License	Throughput	Tier	Network Stack License
ISR-10M-IPB ISR-10M-SEC	10 Mbps	T0	NWSTACK-T0-E
ISR-50M-IPB ISR-100M-IPB ISR-50M-SEC ISR-100M-SEC	50 Mbps 100 Mbps	T1	NWSTACK-T1-E
ISR-250M-IPB ISR-500M-IPB ISR-1G-IPB ISR-250M-SEC ISR-500M-SEC ISR-1G-SEC	250 Mbps 500 Mbps 1 Gbps	T2	NWSTACK-T2-E

Device License	Throughput	Tier	Network Stack License
ISR-2.5G-IPB ISR-5G-IPB ISR-10G-IPB ISR-2.5G-SEC ISR-5G-SEC ISR-10G-SEC	2.5 Gbps 5 Gbps 10 Gbps	T3	NWSTACK-T3-E
ISR-10M-APPX ISR-10M-AX	10 Mbps	T0	NWSTACK-T0-A
ISR-50M-APPX ISR-100M-APPX ISR-50M-AX ISR-100M-AX	50 Mbps 100 Mbps	T1	NWSTACK-T1-A
ISR-250M-APPX ISR-500M-APPX ISR-1G-APPX ISR-250M-AX ISR-500M-AX ISR-1G-AX	250 Mbps 500 Mbps 1 Gbps	T2	NWSTACK-T2-A
ISR-2.5G-APPX ISR-2.5G-AX	2.5 Gbps	T3	NWSTACK-T3-A

Note Cisco ISRv devices do not support 5 Gbps and 10 Gbps throughputs.